REPORT

ON

MEDICAL & HEALTH WORK

IN

THE SUDAN

FOR THE YEAR

1929

McCorquodale & Co. (Sudan) Limited Khartoum. 1454

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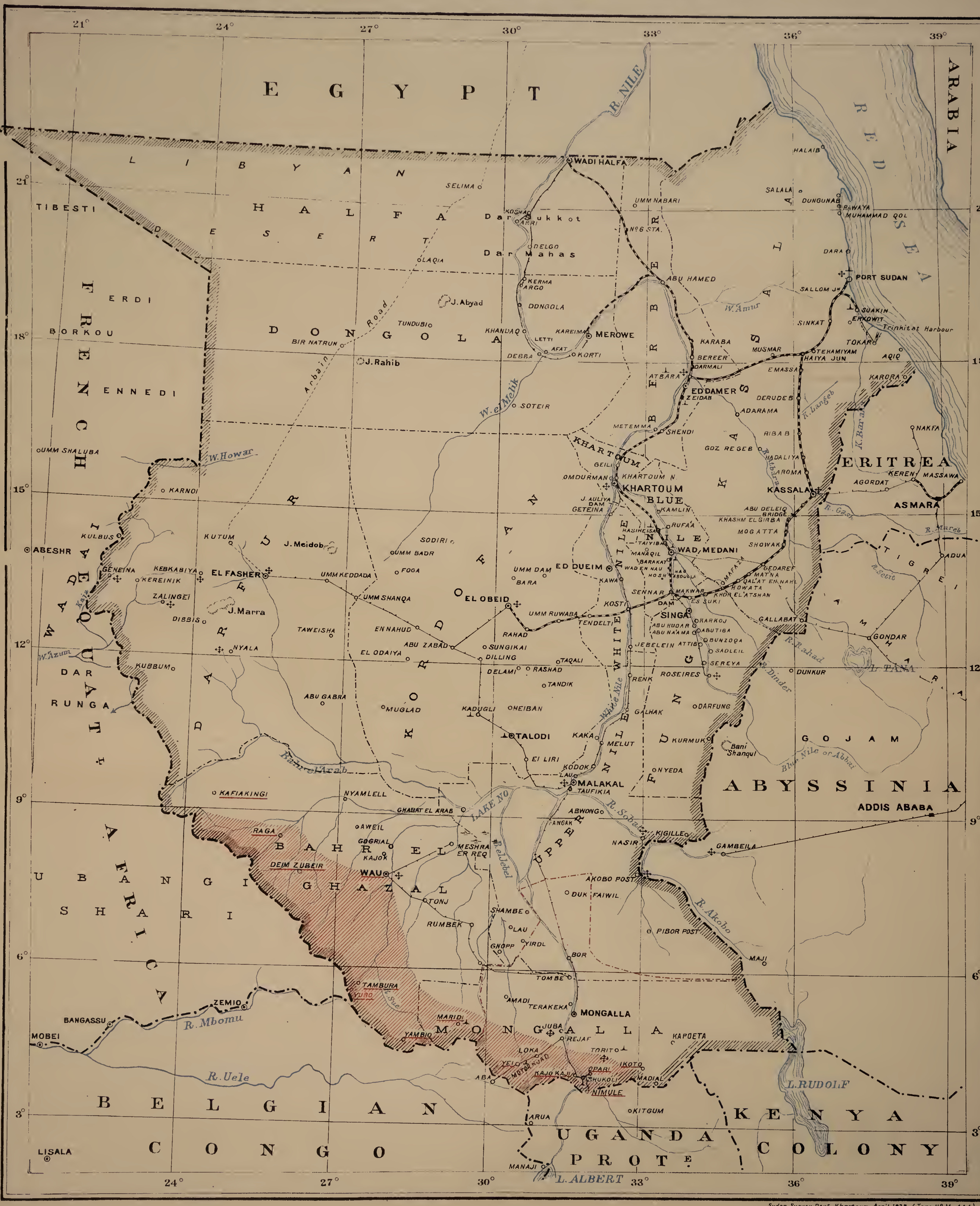
THE ANGLO EGYPTIAN SUDAN



Sudan Survey Dept. Khartoum, April 1928 (Topo. No M. 414)
Corrected March 1929 [illegible]
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Reference.

RAILWAYS	━ ━ ━ PROPOSED - - - -
TELEGRAPHS or TELEPHONES	- - - -
INTERNATIONAL BOUNDARIES	━ · ━ · ━
PROVINCE BOUNDARIES	— · — · —
WIRELESS STATIONS	✣
PROPOSED & EXISTING GINNERIES	⊥
SLEEPING SICKNESS AREA SHADED IN RED	▨
MONGALLA PROVINCE BOUNDARY PRIOR TO 1927	— · — · —

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ANNUAL REPORT 1929

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GENERAL REMARKS ON HEALTH AND PROGRESS.

The general health of the Sudan was good during the first part of the year, but the rains were exceptionally heavy over the southern, central and most of the northern part of the Sudan, and as a result the incidence of epidemic malaria was very high during the autumn months. This was particularly the case in the Gezira area, where the rains were heavier than any recorded since 1906. Cold weather set in at the end of November and the epidemic was brought to an abrupt close. This was in marked contrast to 1927 when a slighter epidemic, owing to an exceptionally mild winter, extended on into the first quarter of 1928.

Small-pox continued to be epidemic in Darfur throughout the year. The number of cases reported increased steadily till they reached a maximum in June; since then they have shewn a progressive decrease. In Kassala Province small-pox occurred in epidemic form in February and March ; the outbreak was vigorously dealt with and no further cases occurred after the end of March. Sporadic outbreaks occurred in seven other provinces, but in no case did they reach epidemic proportions. (Vide p. 6.)

Cerebro-spinal fever was again widely sporadic throughout Mongalla Province. The disease reached epidemic proportions in Kajo-Kaji district in November and December, it spread to Amadi district in August and September, and by December had infected the Rumbek district in the Bahr-el-Ghazal. The Meridi district of Mongalla Province has, up to date, remained unaffected. Only scattered cases occurred in the rest of the Sudan with the exception of a small outbreak of ten cases in the Gedaref district. (Vide p. 3.)

Relapsing Fever. Darfur has been maintained free of Relapsing Fever, except for three small outbreaks which have occurred along the western border. They were promptly dealt with and no spread of the disease took place. Infection in each case was traced to French territory.

Health Conditions at Khartoum. A marked improvement of health conditions of Khartoum, Khartoum North and Omdurman is recorded. This was especially evidenced in a reduction of the incidence of Bacillary Dysentery by 30 per cent., of Diphtheria by 20 per cent. and a reduction in the number of cases of primary malaria from 155 to 86 cases. As the incidence of primary malaria was unusually heavy throughout the Sudan, and as there was no corresponding diminution of Bacillary Dysentery and Diphtheria in the rest of the Sudan, this diminished incidence may be fairly attributable to local sanitary effort enabled by the provision of additional funds, and is a subject for congratulation. (See report on Health, Khartoum Province, page 60.)

Progress of Medical Work. Medical work has shewn still further progress. This progress has been especially marked in Kordofan, where the number of attendances of out-patients during the year has been increased by 115,000. Similarly, marked progress has been made in Darfur, where the institution of eight dispensaries at various important points throughout the province has brought medical assistance within reach of a considerable proportion of the population.

In the Upper Nile Province, medical arrangements were made for the care and treatment of the recalcitrant Nuer tribes which were concentrated in the Sobat—Zeraf district. These arrangements resulted in medical assistance being afforded to large section of the population, previously almost untouched by medical work, and will no doubt establish among these tribes trust and confidence not only in medical work, but in the good intentions of the Government. This marks a further step in the complete medical penetration of this province, which has been taking place since 1921, and which has made such rapid progress during the last few years.

Sleeping Sickness. No new cases of sleeping sickness occurred in Mongalla Province in 1929, and no new indigenous cases have occurred in this province since 1927. Although there is every reason to believe that the fly in this province has ceased to be infectious, yet it is impossible to relax the precautions taken, owing to the activity of the disease on the other side of the boundary, both in Uganda and the Belgian Congo. The existence of sleeping sickness in epidemic form at Aringa, some thirty miles on the Uganda side of the boundary, has given rise to considerable anxiety.

There was a further decrease in the number of new cases found in the Bahr-el-Ghazal Province, from 29 to 18, and every evidence seems to show that in spite of the heavy infection across the border in the French Congo the disease will soon cease to exist in the Sudan (vide Sleeping Sickness Report, page 25).

Leprosy. The work of segregating lepers in the southern Bahr-el-Ghazal and in Mongalla Province has made very good progress. A total of 3,181 lepers had been segregated in these areas up to the end of the year.

The existing colonies with one exception are expected to be self-supporting by the end of 1930, excepting that a free ration of salt will be made (vide Leprosy Report page 19).

HEALTH OF OFFICIALS.

This has been satisfactory, and shows some further improvement in spite of the fact that malaria was widely epidemic in the autumn months as a consequence of the exceptionally heavy rains.

British officials. The average number of days lost for each official was 3 as against 3.8 in 1928 and 4.7 in 1927.

Sudanese officials. The number of days lost was 1.8 days as against 1.9 in 1928 and 2 in 1927.

Egyptian and Syrian officials. The number of days lost was 1.2 as against 1.9 in 1928 and 2.3 for 1927.

The following table shows sickness of classified officials :—

Nationality	No. of officials employed	Total		Average days sickness		Died	Invaliding
		Placed on sick list	No. of days' sickness	For all officials	For those who were sick		
British	983	256	2983	3.0	11.7	2	6
Sudanese	2572	482	4530	1.8	9.4	2	12
Egyptians and Syrians ..	1505	219	1765	1.2	8.1	5	4
Other Europeans	90	10	75	.80	7.5	—	2
Other non-Europeans ..	21	—	—	—	—	—	—

EPIDEMICS.

CEREBRO-SPINAL MENINGITIS.

A total of 464 cases was recorded for all the provinces, with 340 deaths. This compares with 335 cases and 274 deaths in 1928 and 426 cases with 242 deaths in 1927.

Of the 464 cases, 446 were in Mongalla Province. The other 18 cases were reported from Gedaref, Kassala, Khartoum, Omdurman and Port Sudan; these were isolated cases with the exception of a small outbreak of eight cases which occurred at Gedaref in May and June.

Mongalla Province. 446 cases occurred in this province as against 332 in 1928 and 410 cases in 1927. In 1928 the main weight of the disease fell on the Latuka district which had been suffering from famine conditions. This year the hill districts of the Uganda border, Kajo-Kaji and Yei, were more heavily affected. In Kajo-Kaji 180 cases occurred, 113 of which occurred in November and December. Thirty cases were reported in the Tali—Amadi district which escaped last year. Thus the whole province has now been affected except the Meridi area which until now has escaped.

It was pointed out in last year's report that Meridi Merkaz and the neighbouring Bahr-el Ghazal districts of Yambio and Tembura had escaped infection and, it was suggested that this exception was due largely to better feeding and better housing. Mongalla Province marches with the Belgian Congo, Uganda and Abyssinia, and in the latter country no attempt is made to control disease. It is clear then that this province will be continually exposed to infection by this or other diseases, and it is only by strengthening the resisting power of the people and by obtaining immediate information as to the outbreak of any disease, that we can hope to keep the province free from serious epidemic outbreaks.

The province is a poor one and the standard of life is generally low. A great deal has already been done to improve the general health of the people by combating sleeping sickness in the affected areas, and Yaws throughout the province, and in the treatment of guinea worm and the ulcers that do so much to diminish the efficiency, and in consequence the food output of the natives. It is clear however that a great deal remains to be done :—

(1) to improve the standard of housing which is very low in this province. The huts are generally small, badly built, overcrowded and too close together;

(2) to improve the general nutrition of the people by increasing their food output.

Cerebro-spinal meningitis has now been epidemic or sub-epidemic in this province for three years, and it is reasonable to hope that it will shortly die down, and that a short period of immunity will follow, but the province will be constantly exposed to reinfection and unless the interval can be utilised in improving the housing conditions of the people, increasing their food supply, and in gaining their confidence in medical matters, similar epidemic conditions will have to be faced in a few years' time.

The following is a statement showing the incidence of cerebro-spinal meningitis in the Sudan since 1908 so far as outbreaks have been recorded.

Record of Outbreaks of Cerebro - Spinal Meningitis.

From 1908 to 1914 only sporadic outbreaks were reported at Khartoum Omdurman and Makwar.

In 1914 an epidemic occurred at Zeidab in Berber Province, at that time a heavily malarialised area; 192 cases were reported.

In 1915 epidemics occurred in:—

Western Kordofan	285 cases reported.
Western Bahr-el-Ghazal	no figures given.
The White Nile Province	1488 cases reported.
Gedaref area..	146 ,, ,,

In 1916, sporadic cases only.

In 1917 an epidemic occurred in Berber Province ; 154 cases were reported.

In 1918, epidemic in Mongalla Province, introduced from Uganda, 402 cases reported (returns very incomplete).

In 1919, epidemic in Mongalla Province ; at Yei 200 deaths were reported and at Kajo-Kaji 150 cases.

In 1920, epidemic in Mongalla Province ; cases reported as follows :—

Yei district	888 cases.
Aliab ,, ...	176 ,,
Meridi ,, ...	outbreak reported.

In 1921, epidemic outbreaks in Kajo-Kaji, Mongalla Province, and at Rumbek, Bahr-el-Ghazal Province near the Mongalla border.

In 1922, epidemics in Amadi district (Mongalla Province) south-west Kordofan, 60 cases reported, and an outbreak of 22 cases among labourers at Wad el Nau, Blue Nile Province.

In 1923, epidemic in Raga district, Bahr-el-Ghazal. Heavy incidence.

In 1924, epidemic in southern Fung Province near the Abyssinian border, 603 cases reported.

In 1925, sporadic cases only.

In 1926, outbreak in south western Mongalla at Ikotos on Uganda border, 28 cases reported.

In 1927 Epidemic in Mongalla Province ..	410 cases.
In 1928 ,, ,, ,, ..	338 ,,
In 1929 ,, ,, ,, ..	446 ,,

It is seen from this statement that Mongalla Province was heavily affected by this disease from 1918 to 1922, in the latter year only the northern district being affected, that a free period occurred in 1923, 1924 and 1925. That in 1926 a small border outbreak took place and in 1927, 1928 and 1929 the disease again became epidemic over most of the province.

DIPHTHERIA.

A total of 177 cases occurred in the Sudan in 1929 as against 197 in 1928. The majority of the cases again occurred in Khartoum, Khartoum North and

Omdurman, where 115 cases occurred as against 139 last year. The cases occurred throughout the year but there was a definite diminution of the incidence during the last five months at a time when the disease has previously tended to increase.

The case mortality in these towns decreased from 22 per cent. in 1928 to 9.6 per cent. in 1929, that for the rest of the Sudan being 21 per cent. If this diminution of mortality is due to earlier notification, there is reason to anticipate a similar diminution in the transmission of the disease.

As regards the rest of the Sudan, 33 cases occurred in a small area of Halfa District which is adjacent to the Egyptian border and is subject to continued reinfection from Egypt ; these cases occurred throughout the greater part of the year. A small epidemic of 14 cases occurred in Wad Medani in July and August but no further cases have since occurred. The other 15 cases occurred sporadically at El-Obeid, Nahud, Port Sudan, Kamlin, Berber and Gedaref.

The case mortality for the Sudan as a whole was 15.9 per cent.

INFECTIOUS JAUNDICE.

An outbreak of infectious jaundice occurred at Wau in the Bahr-el-Ghazal. A total of 18 cases was reported of which 11 cases occurred in one company of Equatorial troops and two cases in another company of the same unit. Five cases occurred among civilians. Seventeen of the cases occurred between March and June. The eighteenth occurred in December.

The common features in all cases were : slow pulse, jaundice, dullness and depression, constipation, pain and tenderness over right hypochondrium, without enlargement of the liver; temperature subnormal or normal, but in some cases raised.

Four cases died comatose; autopsy in one case presented features resembling acute yellow atrophy. Owing to the distance from a laboratory it was not possible to make a bacteriological examination.

INFLUENZA.

Sporadic outbreaks only occurred.

MEASLES AND WHOOPING COUGH.

No outbreaks of any importance occurred.

RELAPSING FEVER (Louse Borne).

Three small sporadic outbreaks occurred in Darfur during the year. Two of these were in Dar Masalit and one in Kuttum district. All of these were in proximity to the French border and infection in each case was traced to French territory. Early information was received and Dispensary Hakims were at once sent out to deal with the outbreaks which were easily controlled.

No doubt occasional sporadic outbreaks of this disease will continue to occur as a result of infection from across the border, but with the establishment of dispensaries and the growth amongst the people of confidence in medical work and medical organisation, these outbreaks will become increasingly easy to deal with.

SMALL-POX.

A total of 6,467 cases of small-pox with 885 deaths occurred in the Sudan in 1929. Of these 6,187 cases occurred in Darfur Province where small-pox was heavily epidemic throughout the year. Apart from Darfur small-pox broke out in epidemic form in Kassala Province in the early part of the year, and 160 cases occurred in the months of February and March. The outbreak was vigorously dealt with, the spread of infection was prevented and no further cases occurred after the end of March. A total of 31 cases occurred in Kordofan Province ; these were sporadic cases distributed over the year from April to December, they occurred for the most part in the western part of the province and were directly or indirectly attributable to infection from Darfur Province. Small-pox also occurred in epidemic form in the Fung Province in the latter part of May and June ; it was promptly dealt with. A small epidemic of 13 cases also occurred in Berber Province in January and February. Sporadic cases occurred in the Upper Nile Province and the Red Sea Province.

The Darfur Epidemic.

Small-pox was introduced into Dar Masalit, the western province of Darfur, in 1927 by French immigrants. From there it spread east and south until by the end of 1928 the whole of western Darfur had become affected. A total of 1,942 cases occurred in the course of 1928 of which 1,312 occurred in the Zalingei district which, owing to its woody and mountainous nature and the timidity and backwardness of its population, is an especially difficult district to deal with.

The epidemic continued during the early part of 1929 and from January 1st to March 31st, 558 fresh cases were reported and 20,000 vaccinations were performed. In April it became clear that the epidemic was spreading east, north and south. From April 1st to July 31st 4,297 fresh cases were reported and 170,000 vaccinations were carried out. In the latter part of the year the epidemic shewed some signs of decline, from August 1st to December 31st 1,332 fresh cases were reported and 165,000 vaccinations were carried out.

In the course of 1929 a total of 355,000 persons were vaccinated and in 1928 13,978 persons had been vaccinated making a total of 368,978. It is not known how many of these vaccinations were successful but assuming that 25 per cent. were successful the total of persons successfully vaccinated during 1928 and 1929 would be 92,244, adding to this 7,087 persons who are reported to have contracted and recovered from small-pox we have a total of 99,331 persons who are likely to be immune to the disease. The population of Darfur is estimated at 500,000. It would thus seem that we are approaching the stage when spread of the disease will become more difficult.

The incidence of the disease in 1929 was again heaviest in Zalingei district with 3,805 cases. Dar Masalit, adjacent to the French border, the next most heavily infected, escaped more lightly with 1,366 cases. The people of this district, although difficult to deal with, have a good rough idea of isolating infected villages. The southern (Nyala) district was less heavily infected with 521 cases and the northern district was but little affected. The Rizeigat tribe of Baggara Arabs escaped infection altogether owing to a strong tribal organisation and vigorous tribal measures of quarantine. The Fasher district which is close to the centre of administration and therefore easier of access and under more complete control, escaped with 357 cases. There was never any anxiety as to the epidemic spreading to the neighbouring province of Kordofan. An organised system of medical work and medical intelligence based on two hospitals and eight dispensaries has been built up in this province during the last four years ; the confidence of the people in the local Medical Service has been completely won and any cases of small-pox were immediately reported and isolated.

Following on the outbreak of relapsing fever in Darfur a system of dispensaries was inaugurated in that province with a special view to meeting the danger of widespread epidemics occurring in this large and newly administered province. In the early part of 1929, six dispensaries were opened at important centres in Darfur and at the latter end of the year a further four dispensaries were opened, but before the Dispensary Hakims so posted had had time to gain the confidence of the people by carrying out routine medical work the province was again visited by a widespread epidemic and the Dispensary Hakims had to be employed on epidemic duties. The presence of these men with their subordinate staff, together with what remained of the relapsing fever staff, proved of the greatest assistance in dealing with this new epidemic. Moreover the increase of motor roads and of motor transport which had taken place during the previous epidemic enabled this outbreak to be dealt with more effectually. In spite of this, however, the epidemic has extended over the greater part of Darfur and accounted for 6,187 cases and 798 deaths in 1929, and 1,942 cases, 357 deaths in 1928, making a total of 8,129 cases, 1,155 deaths for the two years, nor can the disease be yet said to be under control although the evidence at hand seems to point to this being achieved in the near future. The great difficulties encountered were :—

(1) the ignorance and timidity of the population leading to concealment of disease,

(2) the difficulty of communication, particularly in the mountain regions,

(3) the difficulty of keeping vaccine active.

As regards (1) and (2) steady progress has been made and is still being made, and this will inevitably result in earlier notification and in outbreaks of disease being more promptly dealt with.

As regards (3). El-Fasher is three days by car from railhead, and western Darfur is at the earliest two days from El-Fasher, and when isolated villages have to be reached several more days may have to be added. The difficulty is being met by installing an ice machine at El-Fasher which will provide sufficient ice to enable vaccines and sera to be kept cool while in store and also to be sent out to distant parts of Darfur with an ample supply of ice.

ENDEMIC DISEASES.

ANKYLOSTOMIASIS.

This disease is mildly endemic in Halfa Province and northern Dongola. In these districts the disease is liable to reintroduction by natives who have been working in Egypt and who have returned infected with this disease. In northern Dongola the position shows steady improvement owing, no doubt, to he administration of Carbon Tetrachloride at the dispensaries with which this province is well supplied. The school returns for Halfa show an infection rate of 1.58%. The school returns for Dongola show no infection.

There is apparently a small endemic area in the Kajo-Kaji area of Mongalla Province. This is a restricted area of some 400 square miles adjacent to the Uganda border. It has little communication with other districts. Five cases have been reported up to date.

There is no evidence at present of this disease becoming endemic in the irrigated area.

ANTHRAX.

Two cases of human anthrax occurred in a tannery at El-Dueim. Investigation failed to incriminate any definite skins. The skins being dealt with at the time came from the Kordofan border. No anthrax has been reported among cattle in the White Nile Province or in Kordofan during the last three years.

BILHARZIASIS.

The primary consideration in this work is to prevent the irrigated area of the Gezira becoming infected with this disease. The infection of this thickly populated area, with its thousands of miles of canalisation, would be a very serious matter, both for the population and for the commercial success of the undertaking.

The secondary considerations are :—

(1) To prevent the pump irrigation schemes, which continue to increase in number, from becoming infected. Six of these pump schemes, three in Berber Province and three in Dongola Province, are infected and although much has been done to diminish incidence of the disease on these farms and to mitigate its severity, it has not yet been possible to break the chain of infection and to render them free of the disease. The difficulty experienced in these cases emphasises the importance of preventing other farms from becoming infected.

(2) To mitigate, and if possible eliminate the disease from the White Nile Province where the infection is largely of the rectal type, and where the effects of the disease on the population and particularly on the children are very severe.

(3) To diminish the incidence of the disease in the various endemic centres at a distance from irrigated areas. In these centres the infection is, for the most part, seasonal only and of brief duration and the resulting constitutional effects are not severe. This work is carried out as part of the routine medical work at the various hospitals and dispensaries.

Dongola Province.

Previously to 1918 bilharzia infection in this province was confined to a few northern villages, but in that year Egyptian labourers were introduced to canalise three pump irrigation schemes in Dongola, and the inhabitants of these areas became very heavily infected with bilharzia. In a few years, not only had the disease become heavily endemic in the pump schemes, but many of the villages up and down the river were infected from the khors and river pools.

Systematic work has been carried out since 1926. At first great difficulty was encountered owing to the discouragement caused by the heavy reinfection rate, but as it has become possible to combine treatment work with antimollusc measures to an increasing extent, the reinfection rate has decreased and this has resulted in a corresponding improvement in the attitude of the people towards treatment.

Considerable progress is reported for 1929 as evidenced by :—

(1) A steady diminution of infection in the general population. 17,925 persons came forward voluntarily for examination and 12 per cent. were found infected with bilharzia as against 18 per cent. last year.

(2) Lower infection rate in the schools. 2,196 boys from the village Koran schools shewed an infection rate of 14 per cent. against 19 per cent. in 1928.

(3) Fewer snails found in the canals of the pumping schemes owing to the continued anti-snail work.

The following points are of interest :—

The examination of 6,274 natives shewed the age incidence to be as follows :-

	Per cent.
(i) Up to 5 years	13
(ii) 5 to 10 years	20
(iii) 10 to 15 years	23
(iv) Over 15 years	12

The disease is very rarely found among women and girls. This is evidenced by the examination of the pupils at the elementary vernacular schools which gave the following results :—

(i) 408 school boys shewed 5 per cent. bilharzia infection.
(ii) 109 school girls ,, 0 per cent. ,, ,,

It would appear that definite improvement has been effected in this province and it is reasonable to hope that this improvement will be progressive.

Berber Province.

Considerable progress has been made towards reducing the snail population of the pumping schemes by the systematic use of molluscicides, both at the annual closing down of the pumps and between waterings when the canals are almost dry. As the likelihood of reinfection becomes diminished owing to the decrease in the snail population it will be easier to persuade infected persons to undertake, and complete, treatment. The pump schemes are closed down for two months in the year and it should be possible in that time to kill all the snails actually in the canals, except possibly a few that have burrowed in the mud before the molluscicide can reach them. If, at the same time, it were possible to cure all infected persons the chain of infection would be broken, but it is difficult to persuade all the infected persons to complete treatment without British supervision and this cannot be arranged at the required time.

The position as regards these canals has considerably improved and it is only a question of time before they are clear of infection.

Kordofan Province.

Infection takes place from snails in the large rainwater lakes. These lakes generally fill in July and dry up towards the end of January. The period of infection is therefore not likely to be more than three months, from the middle of October to the middle of January. No antimollusc measures can be taken as this would be likely to arouse suspicion and resentment among the people who water their cattle in these lakes. The Medical Inspector reports that successful propaganda work has been carried out, that the reinfection rate is diminished, and that the people are coming forward for treatment. This improvement is not yet reflected in the school statistics.

In June, holes were dug at the low-lying parts of one of the dried-up lakes. Bullinus contortus snails were discovered at a depth of half a metre, and were found to be viable. The earth at this depth was moist. As the rains commence early in July, there is every reason to suppose that snails survive until the lakes refill. It would be interesting to know in what quantity these snails survive and if any bilharzia-infected snails are among the survivors. Immature forms of the Bullinus snails have been found within three weeks of the filling of the lakes. Infected snails have not been found in the lakes until the end of October. A larger number of snails will have to be examined before definite conclusions are arrived at from these observations.

White Nile Province.

The incidence of the disease in the northern part of the province is heavy. The school examinations shew an infection rate of 28.57 per cent. in the primary school and 30.5 per cent. in the six elementary schools. The infection in this northern part of the province is almost entirely of the rectal type and the constitutional effects are very severe, giving rise to dysenteric symptoms with anaemia and marked debility.

The problem of the prevention of the transmission of the disease is a difficult one. The Planorbis snail is to be found, not only in the shallow khors and pools, but also in large numbers in the shallow water at the edge of the river, the current being sluggish and the banks shelving. It is obviously impossible to kill the molluscs in the open river and it is also difficult to prevent the boys from bathing in the river opposite the villages or the men walking into the river with their cattle or for other reasons. Propaganda is being carried out as to the danger of contaminating water with urine and faeces, and every encouragement is given to infected persons to come forward for treatment ; at the same time wells are being dug in the villages to obviate people coming to the river to draw water.

It is only when the reinfection rate diminishes that people can be persuaded to come forward in large numbers for treatment and the position begins to improve progressively, but in this province, where the evil effects of the disease are so marked, the stage of progressive amelioration has not yet been reached.

Observations on the snail incidence. The common snail in the northern part of the province is the Planorbis Boissyi, which can be found in large numbers on the shallow banks of the river, in khors and pools.

The river rises in the middle of June and it would appear that the snails are carried down by the flood. In the months of October and November no mature snails are found, but immature snails of both varieties are found on the masses of reed (Um Suf) which are carried down on the flood from the upper regions of the river. In March, mature snails are again found in large numbers. It would appear then that the disease is only transferred in this province during the months of March, April, May and early June. This would appear to make the prospect of eliminating the disease as a serious endemic factor less hopeless. The increasing provision of alternative well water supplies should tend to diminish reinfection.

The danger of the infection of the Gezira canals by infected immigrants from the White Nile is a serious one as no quarantine can be enforced on these people who live on either side of the river alternatively.

Darfur Province.

Information as to the incidence of this disease in Darfur is at present incomplete, but such observations as it has been possible to make, suggest that the disease is very prevalent, especially in the Baggara area of southern Darfur. At Sibdu, in the Baggara area 90 per cent. of the boys attending the village school were found to be suffering from bilharzia. There are large fresh-water lakes at Sibdu, which may retain water until the middle or end of March. In El-Fasher, out of 95 boys examined at the elementary school, 31 per cent. were found to be infected.

Natives of Darfur come in large numbers to work in the Gezira irrigated area. The majority of these are examined at Kosti and El-Dueim for bilharzia, and those found to be infected are detained for treatment.

Blue Nile Province. (Irrigated Area.)

The measures taken to prevent this area becoming infected are : —

(i) Quarantine at Wadi-Halfa of labour imported from Egypt.

(ii) Quarantine at Kosti and El-Dueim, on the White Nile, of immigrants entering the Gezira from Kordofan and the west.

(iii) Anti-bilharzial work in the principal endemic areas in the Sudan.

(iv) Enforcement of regulations to prevent bathing in, and urination and defaecation into, the canals.

(v) Propaganda among the natives.

(vi) Treatment of all infected cases that can be found in the irrigated area.

(vii) Destruction of snails in the distributary canals during the non-watering period.

The measures enumerated under (i) to (vi) are very useful in diminishing the likelihood of infection, but they are partial in their action and cannot ensure the canals from becoming infected. In the final resort reliance must be placed on the destruction of all snails in the infected canals. If this can be carried out effectively, the chain of infection can be broken for several months while the other measures are being enforced.

The position with regards to the infection of the canals in the spring of 1929.

In 1926, a survey of the original 300,000 acre area was carried out. A total of 23,297 men and 3,988 children were examined. Of these, 921 were found to be infected and were treated. Of the 921, only 76 were natives of the irrigated area, and of these 37 were boys, and therefore almost certainly infected from the canals of this area. These children were living in six villages and it is fair to assume that the neighbouring canals were to some extent infected.

In the spring of 1929 a further survey was made in the same area and 22,639 persons were examined. Of these 5,061 were children. 578 adults and 123 children were found to be infected. Of the children, 37 only were local inhabitants. These 37 children were living in 22 villages. Thus, although the number of locally bred children infected was not increased, the number of villages infected was increased from 6 to 22.

Of the 701 cases found to be infected,

108 belonged to the Blue Nile Province,

281 belonged to other Sudan provinces, and 312 were immigrants from the west.

All the 701 cases completed treatment in the Wad Medani hospital or in the dispensaries, with the exception of 85 who disappeared.

Infection of snails.

In the early part of the year (1929) infected snails were found in four of the canals. It is probable that if a more prolonged search had been made other canals would have been found to be infected. Arrangements have been made for the more regular collection of snails from every canal in the area and for their better labelling and despatch for examination throughout the ensuing year. It is hoped that valuable information will thus be obtained as to the distribution, breeding places, and infection of the snails.

Snail Destruction.

In 1928-1929, the area canalised was increased to a total of 470,000 acres. Of this it was only considered necessary to deal with the original 300,000 acres. In this area a length of 1,185 kilometres of distributary canals had to be dealt with, of which 779 kilos were treated with sizolin whilst the remaining 406 kilos were dried, dug out and resectioned by the Irrigation Department.

Effective mollusc destruction on this extensive scale demands perfect co-ordination and synchronisation between the sanitary staff who are treating the water and the irrigation officials who are regulating its admission and discharge. This was attained in 1929 in a higher degree than formerly and as a result, the work of snail destruction appears to have been much more complete than in previous years. Whereas in 1928, adult snails appeared almost as soon as the water was readmitted to the canals, in 1929, very few adult snails were found in the canals as late as November. It would be reasonable to suppose then, that such infected snails as had existed in the canals in the early part of 1929 were killed off by anti-mollusc operations and that very few snails reached the age of infectibility until December.

There are then good grounds for hope that the canals in this area will start 1930 in an uninfected condition and that the efforts which are made to diminish the number of infected persons, and to prevent such persons infecting the canals, will prevent their further reinfection except possibly to a very limited extent, and that easily rectifiable by the anti-mollusc measures to be taken in 1930.

In the absence of any certain means of excluding infection from these canals it would seem that in this method of annual mollusc destruction we have a clumsy but effective measure of limiting the possibilities of infection. Later when the immigrant population is under more complete control and the infection rate for the irrigated area has been further reduced, it may be possible to dispense with this exacting and expensive precaution.

The position as regards the permanent infection of this area is not yet clear, but it is more favourable than it was at the end of 1928. By the end of 1930 it should be possible to express a more informed opinion as to the possibility of keeping this net-work of canals clear of infection.

Bilharzia Quarantine.

All westerners, *i.e.*, all persons coming from west of the White Nile Province with a view to working in the Gezira, are examined for bilharzia at Kosti or El-Dueim. All those found to be infected are detained for treatment.

(i) **Kosti Quarantine.** A total of 14,543 persons was examined in the course of the year. Of these 2,621, or 18 per cent. were found to be infected and 2,043 were cured and allowed to proceed to the irrigated area.

(ii) **El-Dueim Quarantine.** A total of 1,832 persons was examined in the course of the year. Of these 316 or 17.2 per cent. were found to be infected and 289 were cured and allowed to proceed to the irrigated area.

Summary.

Systematic work was started in Dongola Province in 1926, and now definite progress is being made.

In Berber Province the work has been intermittent, owing to difficulties in ensuring British supervision, but there is evidence of some progress being made towards freeing the pumping schemes from infection.

In Kordofan the infection is a seasonal one and therefore not severe. Action has to be limited to propaganda, and treatment of infected cases when they present themselves. It is doubtful if any appreciable alteration in the incidence of the disease will be effected until it becomes possible to attack the mollusc hosts.

The White Nile Province is very heavily infected. The infection is largely rectal in type and the constitutional effects are severe. It is not possible to treat the mollusc hosts on a considerable scale, and in consequence the reinfection rate is high, and the people are therefore disinclined to seek treatment. Action is being taken on the lines of propaganda, and the provision of alternative water supplies.

Darfur Province is believed to be heavily infected. For the present it will only be possible to combine bilharzia treatment with the treatment of other diseases. Anti-mollusc measures will be impossible for sometime to come.

As regard the Blue Nile Province, the protection from bilharzial infection of the net-work of irrigation canals extending over a considerable part of this province is recognised as being a matter of urgent importance. The position at the end of 1928 and the beginning of 1929 was disquieting, as there was reason to believe that a number of the canals were infected with this disease. The systematic mollusc destruction carried out in the autumn of 1929 gave very much better results than had been obtained previously. It is believed that the infected snails have been destroyed and that we are starting the new year with uninfected canals.

A further survey of the population for bilharzia infection is being undertaken, and should be completed in April, 1930. This survey like the previous one is being accompanied by the treatment of infected cases. The outlook as regards the irrigated area appears to be more hopeful than it was at the end of 1928.

BLACKWATER FEVER.

Thirty cases of blackwater fever were reported in 1929 ; with eight deaths. This compares with 21 cases in 1928, with 5 deaths ; the increase corresponds with a heavier incidence of malaria.

The race incidence was as follows : —

Southern Europeans	5 (2 Greek, 3 Italian, all recovered)
Egyptians	8 (5 died).
Syrians	3 (1 died).
Algerians	1 (died).
Sudanese	11 (all recovered).
Abyssinians	1 (died).
Yemeni	1 (recovered).

It is noticeable that no persons of British nationality were attacked by this disease in 1929. The relative freedom from blackwater fever of persons of British birth—both officials and non-officials—during recent years points to the efficacy of good food and housing, and of better mosquito protection in the avoidance of this disease. The southern Europeans attacked were for the most part living under unsuitable conditions.

The cases were distributed as follows: -

PROVINCE.	Station	Nationality.	Result.
Bahr-el-Ghazal	Wau	Egyptian	Recovered
	,,	Jaali	,,
	Yambio	Sudanese	,,
Blue Nile	Makwar	Mahasi	,,
	,,	Syrian	,,
	,,	Egyptian	,,
	,,	,,	Died
	Wad-Medani	Dongolawi	Recovered
	,,	,,	,,
	,,	Egyptian	Died
	,,		
Khartoum	Khartoum	Yemeni	Recovered
	,,	Egyptian	Died
	,,	Greek	Recovered
	,,	Abyssinian	Died
	,,	Sudanese	Recovered
	,,	,,	,,
	,,	Algerian	Died
Kordofan	El-Obeid	Jaali	Recovered
	,,	Sudanese	,,
	,,	Greek	,,
	,,	Syrian	,,
	Talodi	Egyptian	Died
	Nahud	Syrian	,,
	Rahad	Egyptian	,,
Fung	Singa	Sudanese	Recovered
Upper Nile	Malakal	Italian (Missionary)	,,
	,,	,, ,,	,,
	,,	Egyptian	,,
Mongalla	Torit	Italian (Missionary)	,,
	,,	Sudanese	,,

It is interesting to note: —

(i) That out of the 30 cases, only 8 occurred south of the 10th parallel.

(ii) That of the 11 Sudanese, 10 were northerners living out of their own provinces.

(iii) That 7 cases occurred in Khartoum, of which two only were probably contracted in the south. This was in spite of the fact that the malarial incidence at Khartoum was not higher than in previous years, when the blackwater fever incidence was negligible. Two only were Sudanese; the others were all foreigners, and most of them had been exposed to malarial infection elsewhere at other times.

(iv) That no negroids, living under native conditions, are known to have contracted the disease.

DYSENTERY.

A total of 1,735 cases was recorded for 1929. This compares with 1,334 in 1928. The percentage of dysentery admissions to total admissions was 3.77.

Of the bacillary cases recorded 8.9 per cent. were European cases ; whereas only 1.24 per cent. of the amoebic cases were Europeans. The incidence of bacillary dysentery appears to be higher where there is a larger European population.

The following table shows the number of cases admitted for amoebic and bacillary dysentery respectively during each of the last nine years :—

	1921	1922	1923	1924	1925	1926	1927	1928	1929
Amoebic ..	477	390	504	605	483	543	835	1086	1447
Bacillary ..	89	48	27	111	326	271	337	248	288
TOTAL	566	438	531	716	809	814	1172	1334	1735
Percentage of all dysentery admissions to total admissions	3.0	2.4	2.9	3.6	4.3	3.7	4.5	4.2	3.77

GUINEA WORM.

This disease is after Yaws and ulcers the most common cause of incapacity for work in certain areas of the southern Sudan.

The areas where it is heavily endemic are :—

(i) Dilling, where 474 cases were treated with acetylarsan, with good results.

(ii) Bahr-el-Ghazal, northern area and Rumbek area, but not the Nile-Congo watershed district.

(iii) Upper Nile Province ; a limited area in the Nuer country round Duk Fadiat ; and in the Shish and Atwot Dinka country. The incidence in some places being as high as 50 per cent.

(vi) Mongalla generally, excepting Meridi district.

The disease appears to be prevalent where the drinking water is drawn from shallow wells and pools existing throughout the year, and to be absent where the source of supply is running water or deep wells, or pools that do not last through the dry season.

There would appear therefore to be a prospect of diminishing the incidence of the disease by increasing the number of deep wells. Apart from this, progress can be looked for by widespread treatment, and so gradually diminishing the infection of the water supply.

Later it may be possible to treat the water chemically so as to kill the cyclops.

KALA-AZAR.

The returns show a marked increase in the number of cases treated for this disease ; 95 cases were reported for 1929, as against 42 for 1928 and 21 for 1927.

This increase is largely accounted for by the increase in notifications from the Fung Province, and Gedaref and Makwar districts.

The Fung area shows 47 cases as against 18 last year. This increase is probably accounted for by the fact that a Medical Inspector was posted to the southern Fung area in 1929 for the first time, and cases came under his observation which would otherwise have remained unreported. As regards the increase in the Gedaref area, the cases reported for the years 1927, 1928 and 1929, are respectively 0,14, and 21. This district has been increasingly opened since the winter of 1927 by the construction of the railway and the development of roads and water supplies, and a corresponding medical development has taken place during the same period. It is probable that the increase in cases reported is due to the increased opportunity afforded for seeking medical assistance, but it is possible also as tentatively suggested in last year's report that some of the increase in this area may be due to the re-occupation of old endemic areas that had been evacuated by their inhabitants as unhealthy.

The Makwar cases have risen from none in 1927 and 1928 to 6 in 1929. This is unexplained, and it is hoped that it is merely a matter of cases seeking medical assistance which would formerly have remained un-notified. The Makwar district borders on the irrigated area.

Two cases of kala-azar were reported from the irrigated area in 1928, and none in 1929. Any tendency for this disease to spread northwards into the irrigated area is being carefully watched. It is thought that such a spread might occur, were the population of that area to become progressively debilitated by endemic malaria and bilharzia, but this is not the case at present.

Of the 95 persons treated for the disease, 6 were Abyssinians ; of these 4 contracted the disease in Abyssinia and two contracted it in the Sudan. A total of 145 Abyssinians entering the Sudan through Roseires were examined for this disease, with negative results.

The following table shows the cases reported in the Sudan during the year their probable place of infection, nationality and place of origin :—

Probable place of infection.	No.	Nationality and origin.	Reported from.
Singa District	27	Taaishi from Ramash	Singa.
		Bungawi from Singa	,,
		Maalawi from Arbatashar	,,
		Tagalawi from Raiat	,,
		Birtawi from Singa	,,
		Watwati from Kurmuk	,,
		Watwati from Kurmuk	,,
		Jaali from Metemma	,,
		Hamzi from Hawazma	,,
		Ingessanawi from Medani	,,
		Dinkawi from Abu Sin	,,
		Dinkawi from Singa	,,
		Jubadi from Abu Sin	,,
		Shaigi from Merowe	,,
		Dongolawi from Singa	,,
		Dongolawi frow El Raiat	,,
		Dongolawi from Kurmuk	,,
		Taaishi from Ramash	,,
		Taaishi from Ramash	,,
		Abyssinian	,,
		Abyssinian	,,
		Reikabi from Bara	El-Dueim.
		Reikabi from Teirira	Makwar.
		Arakia from Makwar	,,
		Fetehabi from Omdurman	Omdurman.
		Jaali from Hillet Mina	Singa.
		Jaali from Hillet Mina	,,
Gedaref District	21	Tagalawi from Wau	Khartoum.
		Berberine from Halfa	,,
		Nubawi from Talodi	,,
		Gumsawi from Gallabat	Kassala.
		Shaigi from Dongola	Gedaref.
		Gambali from Korti	,,
		Fellati from Tokar	Kassala.
		Furawi from Gedaref	,,
		Mahasi from Gedaref	Gedaref.
		Abbadi from Berber	Atbara.
		Jaali from Berber	Makwar.
		Shaigi from Dongola	Gedaref.
		Massalit from Seraifa	,,
		Shaigi from Dongola	,,
		Mario from Eritrea	,,
		Furawi from Omdurman	,,
		Thubatawi from Shereik	,,
		Dongolawi from Dongola	,,
		Mahasi from Gedaref	,,
		Bushari from Omdurman	,,
		Abbadi from Berber	,,
White Nile Province	3	Shankhati from Fachyshoya	El-Dueim.
	---	Hasani from Abu Tbash	,,
		Khali from Shitaib	,,
Abyssinia	4	Makadi from Dangala	Singa.
		Mulata from Gomi	,,
		Abyssinian	Roseires.
		Abyssinian	Makwar.
Makwar	6	Agli from Omdurman	Makwar.
		Furawi from Darfur	,,
		Egyptian from Luxor	,,
		,, ,, Gous	,,
		Komawi from Roseires	,,
		Digawi from Talodi	,,
Dinder	8	Gahalawi from Omdurman	Khartoum.
		Nubawi from Gebel Kafai	,,
		Berberine from Halfa	,,
		Nubawi from Talodi	Makwar.
		,, ,, ,,	,,
		Talodawi from ,,	,,
		Fellati from Nigeria	,,
		Hamadi from Dinder	Singa.
Kassala District	2	Mario from Eritrea	Kassala.
		Nubawi from Talodi	Gedaref.
Roseires	3	Furawi from Arbatashar	Singa.
		Sabaghabi from Dakhla	Roseires.
		Lahawi from Rufaa	,,
Kurmuk	18	Bidairi from Singa	,,
		Fungawi from Kurmuk	,,
		16, local men	,,
Bahr-el-Ghazal	1	Dinkawi from Lawo	Khartoum.
Unknown	2	Indian sailor (landed)	Port Sudan.
		Abbasi from Shereik	Kassala.

The following lists show the nationalities and presumed sources of infection of the cases reported in 1929 :—

Nationalities.	
Abyssinians	6
Eritreans	2
Egyptians	2
Southern negroids	2
Westerners	7
Nubawis	7
Northerners	68
Indians	1
	95

Source of Infection.	
Singa District	27
Gedaref ,,	21
Dinder	8
Kurmuk District	18
Makwar ,,	6
Abyssinia	4
White Nile Province	3
Roseires District	3
Kassala ,,	2
Bahr-el-Ghazal	1
Unknown	2
	95

LEPROSY.

A review of the inauguration of the scheme for the control of leprosy in the Sudan was given in last year's annual report. Considerable progress in segregation has been made during the year.

Table " A " shows the admissions by years, of lepers in the sleeping sickness areas.

Table " B " shows the number of lepers under treatment in all parts of the Sudan on December 31st 1929.

TABLE " A."

YEAR.	Mongalla.				Bahr-el-Ghazal.	
	Yei.	Kajo-Kaji.	Opari.	Meridi.	Source Yubo.	Yambio
1927	57	50	12	50	140	55
1928	70	29	44	181	372	—
1929	248	212	151	119	524	867
TOTAL ..	375	291	207	350	1,036	922

Total Mongalla	1,223
,, Bahr-el-Ghazal	1,958
TOTAL	3,181

TABLE " B."

Stations	Admissions	Readmissions	Died	Discharged	Deserted	Remaining
Mongalla.						
Yei	248	—	24	1	6	331
Kajo-Kaji ..	212	—	24	—	—	263
Opari	151	—	10	—	7	190
Meridi	119	—	3	—	—	340
Bahr-el-Ghazal.						
Source Yubo ..	524	5	16	13	3	993
Yambio.. ..	867	3	1	3	1	920
Wau	57	—	4	11	28	108
Gedaref	5	—	2	14	1	12
Omdurman ..	12	—	3	1	3	51
Malek	—	—	—	—	—	22
Malakal	—	—	—	—	—	11
TOTAL ..	2,195	8	87	43	49	3,241

In Tembura district there are still some 500 unsegregated lepers. These are being brought in immediately.

In Yambio district there are 600 to 700 to come in, but since the new settlement was only started ten months ago, there will necessarily be some delay in accommodating all.

In Meridi district the estimate of unsegregated lepers is 50. These are being brought in at once.

In Yei, Kajo-Kaji and Opari districts all lepers have been segregated.

Reports indicate that all lepers at present segregated in the sleeping sickness areas, with the exception of the Meridi colony which is mostly composed of very advanced cases with few relatives living with them, will be self-supporting by the end of 1930. The lepers at Source Yubo, who have not yet had time to make cultivations of their own, are subsisting for the most part on the reserves of manioc planted in the sleeping sickness settlement.

The delay in dealing with leprosy in the Sudan was due to the prohibitive cost of feeding thousands of lepers, and there were doubts whether leper colonies could be made self-supporting; there is now evidence to show that, modelled on the lines adopted for sleeping sickness settlements, they can be. I consider that after 1931 no colony in the sleeping sickness areas, except possibly that of Meridi, should require a ration from the Government except salt.

It is doubtful if leper colonies can be made self-supporting unless relatives are allowed to accompany their sick. Among the southern pagan tribes of the Sudan the family tie is strong and segregation without relatives would cause resentment.

It is certain that some of the healthy relatives must get infected living in the colonies, but the treated leper is, presumably, less contagious than the untreated; the relatives are under close medical supervision and obtain treatment at the first sign of disease, and in the conditions in which they live in a colony their health is so much better maintained throughout the year that their liability to infection should be lessened.

In the colony at Source Yubo an inspection of all the relatives living in the colony revealed an infection of 23 per cent. At the same time an inspection was made of a number of relatives who were making application to live in the colony; among these also the percentage of infections was 23 per cent. It is probable that all these cases acquired the infection before entering the colony, and time is needed to obtain evidence of the infectivity of the treated leper.

The great majority of the lepers in the Sudan dwell in the sleeping sickness areas. Outside these areas it is estimated that there are rather more than 1,000. The majority of these are in northern Mongalla and northern Bahr el Ghazal. Arrangements have been made to form a colony of 300 registered lepers in northern Mongalla, west of the Nile. Between this colony and Meridi treatment is given to lepers at Lui by the Church Missionary Society. There is already a colony at Wau, but there are probably several hundred more in north and west Bahr el Ghazal to be brought in.

In Upper Nile Province there are few lepers, 22 are under treatment by the Church Missionary Society at Malek and 11 at Malakal. In the north and east the leprosy incidence is small. Fourteen are under treatment at Gedaref, and at Omdurman there are 51 inpatients and 19 outpatients.

In Darfur lepers are reported to be fairly numerous in Zalingei district, but interference in the present condition of the province is inadvisable. The rest of Darfur is practically free from the disease.

By the end of 1930, with the experience we shall have at our disposal it should be possible, with quite a small outlay of money, to bring every leper in the Sudan south of latitude 10 N. into segregation and these would constitute about 95 per cent. of all the lepers.

There is now ample evidence to show that leprosy was rapidly increasing in the southern Sudan and that the measures taken were essential to avert the disabling of a heavy percentage of the population. In Yambio district in one village 8.8 per cent. of the inhabitants suffered from leprosy and a leper survey of the district revealed that 2.8 per cent of the population of the district were infected ; moreover it was believed that a considerable number of lepers were concealed.

TREATMENT.

All medical officers engaged on leprosy work in the Sudan are agreed that alepol is the most effective and most convenient drug.

Reports all state that the majority of cases show marked improvement with treatment, but that relapses are common. Very early cases respond to treatment readily. There, is, however, at present insufficient data from which the effect of treatment can be judged.

(Sgd.) G. K. MAURICE.

MALARIA.

The malaria incidence was increased throughout the Sudan, except to the north of the 19th parallel, as a result of the heavy rains. During the autumn months malaria became widely epidemic throughout the central provinces, and epidemic conditions were especially severe in the central and southern sections of the irrigated area (vide Health of Irrigated Area, page (55). The epidemic subsided with the onset of the colder weather, early in December.

In the southern provinces, malaria is endemic, but tends to become epidemic at the seasons of heavy rainfall. In these provinces, excepting in the large towns and during the drier months of the year, little can be effected by anti-larval measures.

Action is taken on the following lines :—

(i) Mosquito protection of officials' houses,

(ii) Propaganda to ensure :—

  (a) the routine destruction of mosquitoes in houses,

  (b) the proper use of mosquito nets and mosquito boots,

  (c) adequate measures to protect servants from malaria,

  (d) the early and complete treatment of all persons suffering from malaria, and especially of servants.

The following is a record of the incidence of the three types of malaria in various parts of the Sudan. As the incidence of benign, malignant and quartan malaria often varies in the same region at different seasons, the figures given are of limited interest. It is hoped in future reports to be able to supplement this information by adding the time of the year at which the observations were made.

Types of malarial infections.

Wadi Halfa. Benign tertian only.

Khartoum	Civil population.	British troops.
	Per	cent.
Benign tertian	19.8	66.1
Malignant ,,	77.6	29.3
Quartan	2.6	3.1
Mixed Benign and Malignant	—	1.5

Omdurman.	Per cent.
Benign tertian	10.3
Malignant ,,	84.5
Quartan	5.2

Blue Nile Province. (Wad Medani hospital.)	
Benign tertian	77.3
Malignant ,,	22.7

Incidence in the Gezira irrigated area

Middle of September —Malignant tertian ring infection. 80-90 per cent. crescents very scanty.

October 1st week	—Benign tertian ring infections getting common.
,, 2nd week	—Malignant tertian and benign tertian about equal.
,, 4th week	—Benign tertian 70 per cent. infections.
,, 19th	—Sudden appearance of crescents, benign tertian gametocytes almost entirely absent.
December 16th	—Sudden flood of benign tertian gametocytes which lasted about a week.

Up till February 15th ; benign tertian sexual forms practically absent ; ring forms common.

Incidence in southern and central irrigated area in December.

	Per cent.
Benign tertian	19
Malignant ,, ...	80
Quartan	1

Gondal, a small pump-irrigated farm sixteen miles north of Makwar ; the parasite proportion in January was :—

	Per cent.
Benign tertian	32
Malignant	25
Quartan	43

Makwar.

Benign tertian..	83.8
Malignant	16.2

El-Obeid. (13th parallel.)

Benign tertian..	88
Malignant ,, ...	12

Nuba Mountains. (10th to 12th parallel.)

Infection for the most part benign tertian.

Northern Shilluks. (10th to parallel 11.30.)

April and May. Malignant tertian predominated.

In the survey of the southern Shilluks in 1928—(9th to 10th parallel)—carried out in January to April, malignant tertian was noted to be the prevalent parasite except in the Zeraf, where only quartan parasites were found.

Lau Nuers. (8th to 9th parallel.)
February and March.

	Per cent.
Benign tertian	83.33
Malignant ,,	6.66
Quartan	10.0

Sexual forms very prevalent in comparison to schizonts.

Shish Dinkas. (6th to 7th parallel.)
November and December.

	Per cent.
Benign tertian	90
Malignant ,,	6
Quartan	—
Slides negative	4

Mosquitoes.

The common malaria carrier in the northern and central Sudan is believed to be Anopheles gambiae (Pyretophous costalis). Anopheles pharoenses is believed to be a common carrier in the vicinity of the "luguds" (rain water lakes) of the Gezira. Anopheles funestus is reported to be the common carrier of malaria in the Upper Nile Province.

MALTA FEVER.

Twenty seven cases of this disease were reported, as against 12 in 1928, and 16 cases in 1927.

The distribution of the cases was as follows :—

Kassala	12	Malakal	4
El-Dueim	4	Wad Medani	3
Makwar	2	Port Sudan	2

RABIES.

Cases of animal rabies occurred in Omdurman, the White Nile, Darfur and Kassala Provinces and on the Red Sea littoral.

One fatal case of human rabies occurred in Kassala.

SCURVY.

Forty seven cases of scurvy were reported. They were all sporadic cases, except 25 which were reported from the Red Sea coast. These were the final cases of an outbreak which occurred in the autumn of 1928 among the nomads, in the southern end of the district, as a result of the failure of grazing, and the resulting lack of milk. The outbreak was referred to in the 1928 report.

SLEEPING SICKNESS

Personnel.

PROVINCE.	NAME.
Bahr El Ghazal	Major J. R. N. Warburton, M.C., R.A.M.C., Senior Medical Officer. El Bimbashi Nesib Effendi Baz, O.B.E. El Yuzbashi Joseph Eff. Tannous Nasr. El Mulazim Awal Husni Eff. Abdalla. El Mulazim Awal Joseph Eff. Trabolsi. El Mulazim Awal Kratchia Eff. Papasian. El Mulazim Awal Joseph Eff. Wienstein.
Mongalla	El Bimbashi Yusef Effendi Derwish, O.B.E., Senior Medical Officer. El Bimbashi Negib Eff. Yusef Yunes M.B.E. El Sagh Faiz Eff. Sulieman Nassar. El Yuzbashi George Eff. Murad Rizk. El Yuzbashi Joseph Eff. Khouri Tabet. El Yuzbashi Mohammed Eff. Emin Talhouk. El Mulazim Awal Souren Eff. Soukiassian.

The admissions for the year ending 1929 for the whole Sudan were 20, 18 in Tembura District, 2 in Yambio District. The total admissions for the past twenty years were 5,450. This report reviews the work done in these twenty years.

After the discovery in 1903 of the cause of Sleeping Sickness by the Commission sent to Uganda by the Royal Society, reports of the spread of the disease northwards in Uganda, the Belgian Congo and French Equatorial Africa towards the Sudan frontier caused the medical authorities in Khartoum anxiety.

In 1905 a British Medical Officer was despatched to Bahr El Ghazal to report on the distribution and habits of the Tsetse flies of that Province and to make recommendations to prevent Sleeping Sickness invading the Sudan.

This officer was followed by others, and in course of time it was established that Glossina palpalis and Glossina morsitans were to be found along a thousand miles of Sudan frontier, from the junction of Bahr El Ghazal with Darfur in the North-West, to Ikotos on the Mongalla Uganda frontier in the South-East, but that G. palpalis was seldom found at more than two hundred miles due northward from the frontier. Until 1909, however, no cases of Sleeping Sickness were found.

In 1909 the chief danger seemed to lie in the Western District of Bahr El Ghazal round Raga, since there was hearsay evidence of a severe epidemic round Rafai and Djema in French Equatorial Africa, and the Western District conducted considerable trade with that area.

Measures accordingly were taken to meet this danger to the Western District of the Bahr El Ghazal. Quarantine camps were established together with examining posts on the three main routes from the French Congo. Porters from the Congo were not allowed to cross the frontier and donkeys were substituted to carry the merchant's goods. Local police were established at the examining posts to see that the regulations were carried out. At the same time water-courses on trade routes were cleared and an isolation camp was made at Raga for any Sleeping Sickness cases that might be found. Chiefs were ordered to bring all persons arriving from the Congo to be medically examined and before the end of 1909 the first two authentic cases of Sleeping Sickness in the Sudan were found at Raga, among emigrants from French Equatorial Africa.

In the past twenty years 73 cases have been detected in the Western District of Bahr El Ghazal, but, although Glossina palpalis is common, these have never become infected.

In 1910, by the terms of an agreement with the Belgian Government the Lado Enclave—that is the area round Yei and Kajo-Kaji—was taken over by the Sudan Government to be incorporated in Mongalla Province. It was known that Sleeping Sickness existed in the Lado and immediate steps were taken to eradicate it. A staff of two British and three Syrian Medical Officers was posted to Yei ; watering places were rendered fly-free by clearing ; regular inspections of all the natives of the district were carried out. By September 1911, 268 cases had been detected in Yei District, and these were segregated in a camp at Yei. In 1912, 140 cases, and in 1913, 139 were admitted, but in 1914 as a result of the past three year's work the admissions fell abruptly to 24, and from 1914 to 1923 never rose above 32. From 1924 to the present day the district has been free from the disease.

In 1914 the adjoining district of Kajo-Kaji was found to be infected and by September, 1915, 187 cases were found and segregated, and in the following year 197. Cases were also found east of the Nile. At the same time that this largely increased area had to come under constant inspection the medical staff was of necessity depleted by the war. Instead, therefore, of the epidemic being brought to a speedy conclusion, as had happened in Yei District with a sufficient medical staff, the epidemic further east dragged on for ten years. In 1917 the admissions were reduced to 95 and remained well below that figure till 1924, when an adequate staff was provided and the admissions rose to 82, followed by a drop to 3 two years later, and from then on the district was freed from the disease.

In Mongalla Province the patients were segregated in camps, three in all, one at Yei, one at Kajo-Kaji and one at Nimule. The patients were housed and fed at Government expense, but were made to work for their treatment a certain number of hours a day. Communal cultivations of considerable size were, in course of time, developed ; in addition patients in their spare time made small cultivations of their own. In about seven years when a number of patients at Yei had been discharged and others had died, the communal cultivations were large enough to support those remaining.

The yearly admissions for Mongalla Province are shown below :—

	Yei.	Kajo-Kaji.	Nimule.
1911	268	—	—
1912	140	—	—
1913	139	—	—
1914	24	—	—
1915	17	187	6
1916	21	197	14
1917	14	95	4
1918	32	42	2
1919	15	63	8
1920	32	54	2
1921	24	31	12
1922	7	68	35
1923	3	5	4
1924	—	82	9
1925	—	10	9
1926	—	3	—
1927	1	—	18
1928	1	—	—
	738	837	123

Total Mongalla 1,698

The Tembura Epidemic—Southern Bahr El Ghazal.

Although cases of Sleeping Sickness continued to be found among emigrants into the Western District of Bahr El Ghazal, cases were not found in the south of the Province until 1918.

In 1916 an expedition left Tembura to assist the French in quelling a rising. Some 800 levies of local Chiefs accompanied the force. The force operated in an area heavily infected with Sleeping Sickness, and at the conclusion of operations the 800 levies scattered to their homes. These levies were an original source of infection of Tembura District but the chief source was a great influx of some thousands of French natives in 1917.

It was unfortunate that the Syrian Medical Officer at Tembura in 1917 lacked experience of Sleeping Sickness and failed to detect a case ; but when a Medical Officer with experience of Sleeping Sickness in Mongalla Province arrived at Tembura in March 1918, he found 60 cases in the first week and 255 in the first six months without going out of the station. These cases were segregated in a camp at Tembura.

At this time there was a great shortage of Medical Officers due to the War. Moreover the journey from Khartoum to Tembura in those days took six weeks. Therefore it was not until October 1918, that the medical staff in Tembura was increased to two by the arrival of a British Medical Officer. At this period, too, the administration of southern Bahr El Ghazal was short of staff and the people backward. There were practically no roads ; there were no maps of any value, and not even a moderately accurate census of the people or lists of important men.

In spite of these obstacles the medical staff traversed the greater part of the district several times and discovered that the epidemic was limited to a strip along the frontier about 150 miles long and 50 broad, and that the adjoining districts were not infected. By October 1919, 621 new cases were segregated ; roads were cut ; bridges and rest-houses built.

But the strain on the medical staff was too heavy and in October 1919 the British Medical Officer was invalided north. The following passage appears in the report he wrote before leaving :—

> " It is a great pity that inspections must cease for want of an officer at the psychological moment when moral supremacy has been established. This is the very time for redoubled efforts and not for a total abandonment of all work for six months. The people will slip back, and it will all have to be gone through again."

A relief was sent down in January, 1920, but unfortunately died three days after his arrival, and there was no other available British doctor till October 1920. Thus it came about that for a whole year one Syrian Medical Officer was left alone in the district and could carry out no inspections. The admissions fell to 192 ; the people reverted to their old habits ; the roads became obliterated and the rest-houses fell down.

A British doctor again took charge in October 1920, and during the following year segregated 656 new cases and restored the district to the condition it had been in when the first British medical officer left. He was handicapped by a severe attack of blackwater fever ten months after his arrival, but continued in the district for another 8 months until relieved.

The admissions for 1922 were 434. It was fully appreciated that this reduction was due to no real improvement in the situation, but rather to the fact that, since the epidemic had spread east and north considerably since its initial outbreak, the meagre staff had latterly discarded the attempt to deal with the centre of the epidemic, in favour of controlling its spread.

It had early on been clear to those engaged on sleeping sickness that not only was the medical staff inadequate, but that a complete change must be brought about in the administration and habits of the infected tribe. Briefly the situation was this. Tembura District was about 12,000 square miles in extent. To the east lay Yambio District and beyond that again Meridi District, both more or less similar in population to Tembura District and both potentially sleeping sickness areas. To the north was the central district of Wau, but the fly belt ended a few miles south of Wau. To the north-west lay the Western District, but isolated from Tembura by 150 miles of uninhabited forest and by tribes with different customs. To the south and west lay the French and Belgian Congo. The Sleeping Sickness Regulations made it illegal for anyone to enter or leave Tembura District without permission.

The normal life of the tribe occupying the greater part of the three southern Districts was a solitary life in the forest, each family living alone with its own huts, cultivations and watering place, in many cases miles from any other habitation. Nothing in the nature of a village existed. It was obviously impossible to clear and render fly-free individual watering places and the only alternative was to group the people into villages round cleared watering places. It is true that to some extent the normal isolated life tended to hinder the rapid spread of the disease, but this was more than counteracted by the wandering propensities of the people.

The crux of the situation seemed to lie in concentrating the people into villages on roads. The advantages of such a concentration were obvious. Village watering places could be cleared and maintained fly-free ; roads could be easily kept open throughout the year ; inspections could be carried out more frequently ; immigrants from the Congo could be easily detected and returned chiefs and headmen would have more authority over their people.

But before so radical a change in the habits of a people could receive sanction there was necessarily some conflict of opinions. Could the disease ever be eradicated and would it not eventually burn itself out ? There was doubt if the Zande tribe could be made to live in villages. And was the upkeep of roads and rest-houses really worth while ?

The answer to this was that the disease had been eradicated in Yei District of Mongalla Province ; the experience of the Loka District of Uganda had proved that the "burning out" process was an expensive one ; and that the people lived quite happily in the Settlement which consisted of a string of straggling villages.

In February, 1923, the district was visited by senior administrative and medical staff and at a meeting held with the local officials the following points were decided :—

(1) The people were to be grouped on the existing roads or roads cut for that purpose.

(2) They were to be grouped round their headmen on these roads and were to remain followers of these, and might not change their allegiance to either headman or chief without permission from the District Commissioner and Senior Medical Officer jointly.

(3) The authority of the chiefs was to be supported and the Sleeping Sickness requirements carried out as far as possible through the chiefs.

(4) Chiefs were to be responsible for the clearing of watering places and road crossings over streams, and the building and maintenance of roads, bridges and rest-houses in their respective countries.

At the same time it was decided to augment the medical staff to seven, one British and six Syrians, and to supply a District Commissioner for Tembura District whose first duty was to assist the medical staff in the control of the epidemic. Up to this time there had been only one Commissioner for the two Districts of Tembura and Yambio.

The new District Commissioner arrived in March and toured the district with the Senior Medical Officer.

The people quickly discovered that the Government meant business ; the census increased by 15,000 ; roads were kept open and rest-houses built. The admissions for the year rose to 839.

Owing to the lateness of the season it was only possible to concentrate on to roads those people living in the most heavily infected area round Tembura. But by June 1st, 1924, everyone in Tembura District was living on a road and the plan was being adopted in Yambio District where cases had begun to occur, and in Meridi District as a precautionary measure.

By the end of September, 1924, the staff had been reduced to four and the admissions had fallen to 276. The following year isolated cases and small local outbreaks kept occurring and roads had to be adjusted, and people shifted from where infection persisted. Many infected fly, of course, necessarily remained in the district, especially round the old homesteads and fishing pools and these, it was found, were being commonly revisited by the people. Gradually defects were remedied, but the admissions for 1925 kept up to 203. Thereafter they fell rapidly, 79 in 1926, 49 in 1927, 26 in 1928 and 18 in 1929.

The admissions and the factors bearing on them are shown on the accompanying table and chart :—

DATE.	No. of cases detected.	MEDICAL STAFF.
1918	255	One Syrian Medical Officer unable to leave the station.
1919	621	One British and one Syrian Medical Officer touring the District alternately.
1920	192	One Syrian Medical Officer unable to leave the station.
1921	656	One British and one Syrian Medical Officer touring the District alternately.
1922	434	One British and one Syrian Medical Officer touring the District alternately.
1923	839	One British and six Syrian Medical Officers touring and concentrating natives into villages.
1924	276	One British and four Syrian Medical Officers ; concentration into villages complete.
1925	203	One British and four Syrian Medical Officers.
1926	79	One British and three Syrian Medical Officers.
1927	49	One British and three Syrian Medical Officers.
1928	26	One British and three Syrian Medical Officers.
1929	18	One British and three Syrian Medical Officers.
	3,648	

The Concentration of the People.

There was far less difficulty in concentrating the people than had been anticipated. An early attempt in 1922 was a failure because it was not backed by close supervision. Grassy streams requiring little clearing were selected by the District Commissioner and the people ordered to group themselves round these. The District Commissioner was detained in the adjoining district, and the medical staff were ignorant of the orders issued. Those headmen who tried to carry out orders were deserted by half their followers who joined those headmen who took up an attitude of passive resistance. The bigger chiefs professed ignorance of the sites allocated. The old roads and rest-houses were useless since the people had nominally moved to sites miles away. Attendances at inspections fell to half what they had previously been and the excuse was always that the people had run away.

In the final concentration a different plan was adopted. With the epidemic blazing, time was all important ; it was quicker to move the people on to the existing roads or roads cut for the purpose of accommodating them, than to survey sites for villages and see that the people moved to them. The chief merit of the plan was its simplicity.

Orders were sent out through the chiefs early in the dry weather that everyone was to be living on a road, in the neighbourhood of their headman or sub-chief, and that the move was to be completed by the early rains ; chiefs were made to report progress regularly. The medical staff were asked to supervise the move on their tours in the district and were given executive authority to issue orders as required. By the first rains in March the majority had come on to the roads.

The chiefs were told that they were to destroy the houses of all those who had not moved by June 1st, and by June 1st all had moved.

Most of the existing roads had come into being as improvements on the native paths linking headman to headman and chief to chief. None of them had been cut with a view to concentrating people on them nor had they been surveyed with a view to permanency. It was natural therefore that in many places they were unsuitable both for residence and upkeep. Often the road ran parallel and close to streams and the people would drink from those streams in preference to the clearings on the road ; sometimes the road would cross streams so frequently that the intervening spaces were useless for fly-free dwellings and sometimes the streams were at such rare intervals that the people living on the roads between would have had to travel far for water. Often it was found that a road crossed a stream where it was densely wooded and required great labour to maintain it clear, though half a mile away there might be a rocky patch with scanty undergrowth needing little clearing. The roadside, too, was not always fertile. A good deal of adjustment had to be made ; so far as possible this was done before the move, but two years elapsed before the adjustments were complete.

The existing roads were not enough to take the whole population and new ones had to be cut. The best plan was found to be to make, where possible, the roads follow the local watersheds. By so doing the roads cut no streams and required no bridging, yet there were plentiful springs from which the people could drink at the sources of streams rising on either side of the watershed and round these the road was made to wind. Moreover, with the absence of bridges, the streams had only to be cleared sixty yards from their source, instead of sixty yards on either side of a bridge ; and it is usually easier to clear a stream at its source than elsewhere in its course.

One striking result of the population inhabiting the roads was the complete withdrawal of Glossina morsitans. Before the concentration many of the roads swarmed with Glossina morsitans and made travel a misery, but once the roads became populated and cultivations established along them Glossina morsitans completely disappeared.

The method adopted in Tembura District of settling the people along the roads proved entirely successful. It was found at first that where there was a clearing of sixty yards on either side of a bridge the people would commonly draw their water from beside the uncleared margin ; from there "fly" would follow them into their houses. It was necessary therefore to insist that the watering place should be beside the bridge, and that no house should be built nearer than 400 yards from water.

In Yambio District, owing to the small degree of infection, rapidity of concentration was not so important as in Tembura District, and the people were put into villages each holding about a thousand people. The sites selected were on grassy streams where the labour of clearing was least, the villages being linked by uninhabited roads. The system is efficient in the control of Sleeping Sickness, but the people do not like it so well as the Tembura plan. The ground round the villages becomes fouled, and, consequently flies are abundant. There is also a lack of privacy, which can be avoided by the Tembura system.

The Source Yubo Settlement.

When the first cases of Sleeping Sickness were found in Tembura in 1918, they were segregated in a camp about a mile outside the station. By September 1919, nearly 900 cases had been admitted. There was the greatest difficulty in procuring food ; the highest tax that had ever been taken out of the district was 60,000 lbs. of grain and ten times this amount was needed. Many patients deserted. It had been demonstrated in Mongalla Province that many years must elapse before a camp of invalids can become self-supporting from communal cultivations of its own making, and clearly in Tembura District the cost of feeding patients, where the number was conjectured to reach several thousands in a few years, was going to be prohibitive even if the food was procurable.

The British Medical Officer in charge therefore conceived the idea of forming a Settlement in which every patient would have his own homestead, grow his own food and live his normal life with his relatives. The Source of the Yubo river rises from the crest of the Nile Congo watershed 25 miles from Tembura and only a few yards from the international frontier, and there it was decided to try the experiment of a settlement, and there on February 20th, 1920, the 669 patients remaining in the camp at Tembura were transferred ; the remainder had either died or deserted.

The medical staff at this time consisted of one Syrian Medical Officer. Under great difficulties a site was cleared for the headquarters of the Settlement ; roads were cut and the patients allotted homesteads along these ; and the innumerable fly-infested streams that abounded in the region were partially cleared. The patients had to be treated and fed since they could not become self-supporting in the first year.

By October of that year, however, when a British Medical Officer was again forthcoming, he found the patients' cultivations the best in the district. But there were many patients who were in poor health and without relations living in the settlement and these had to be fed at Government expense. By April, 1922, however, the settlement had become self-supporting.

The organisation of the settlement was based on tribal lines. The patients were divided into seven divisions, each with a headman in charge. These groups were sub-divided into sections of thirty or forty, the men, women and boys separately ; female children were classified as women. All sections of a division had their own headmen, headwomen and headboys. An area of ground with roads was allotted to each division.

It was necessary to insist that patients should live on a road in order to keep them under observation. To economise space a main road would be cut parallel to a cleared stream and five or six others, ending blindly, were cut at right angles to it, each to accommodate a section. Loop roads and roads linking up with other roads were cut wherever the ground was fertile and along them the people were spaced. In course of time there were fifty miles of roads in the settlement. New patients were given their choice of section and division since nearly everyone had a friend or relative already in the settlement, and if an uninfected husband wished to settle with his infected wife, he was allowed to do so and to bring his other wives and children with him, and a special section in each division was created for such cases. Eventually as the settlement achieved popularity there were more healthy relatives than patients living in the settlement, and there was much trouble in keeping out people with no claim to live there.

For the privilege of treatment every patient had to work for the Settlement half a day a week and every uninfected relative had to work ten days a year. Each division had its day of work ; No. 1 Monday, No. 2 Tuesday and so on. There was no work on Saturdays, medicine day, and none on Sundays. It was found, however, that domestic arrangements were interfered with if the men and women of the same division worked on the same day and this had to be altered accordingly.

The function of the divisional headman was to be the first link of responsibility between the medical staff and the patients ; he was usually a big man in his own country. The duties of the heads of sections were more arduous. They were responsible under the supervision of the headmen of the divisions for parading their sections in the early morning for work. Every day at one o'clock they had to come to the office to report deaths, desertions, absentees and to take any orders there might be. One would have thought that an unpaid post entailing a walk of several miles daily to the office would have been unpopular. But the reverse was the case ; and a threat to dismiss a headman from his position was enough to ensure the most meticulous behaviour ; even the boys were the same. By this very simple means the medical staff was able to keep itself informed about the most intimate details of the twenty square miles of the settlement.

On Saturdays all the patients paraded by divisions and sections and received their weekly injections of drugs, each appearing in his proper place, answering his name as it was called out and receiving his weekly ration of salt as he got his injection of medicine.

The patients, on their working day, paraded shortly after sunrise and were dismissed at 1 p.m. The chief work was on the communal cultivations and the maintenance of cleared streams and upkeep of buildings. Food also had to be collected for the newcomers and the helpless.

The chief crop grown in the communal cultivations was Manioc as yielding the greatest return for the labour. It takes two years to mature. In May, 1922, the issue of Manioc was substituted for the ordinary grain ration to those newcomers without cultivations of their own, and thereafter no other ration than salt was issued except to the comparatively few helpless cases unsupported by relatives and living in hospital. Manioc is not a complete diet, but a surplus was issued and this surplus the recipients bartered away for other forms of food. In 1928, the reserve food supply in the ground from this source only was estimated at 450 tons ; the total communal cultivations had reached 1,000 acres, about four-fifths Manioc, the rest such foods as ground nuts, simsim and maize, which were used as food for the helpless and as seed for the other patients in the spring.

On Sunday mornings at a fixed hour natives from French Equatorial Africa were allowed across the frontier, and in the market place in front of the office, to barter wares with the patients.

The market on the boundary was started in order to allow Sudan subjects to meet their relatives across the border and to prevent the crossing of the frontier by stealth ; and also to allow exchange of goods between the two countries. There are many commodities used by Sudan natives which are only obtainable in the Congo. French natives brought goods to the Settlement in order to acquire salt, of which all natives of those parts are physiologically starved. The ration of salt the patients received was more than their actual need, but it was and is a most important factor in the maintenance of good order in the settlement. The patients were seldom able to earn money, but with their surplus salt they could buy those little luxuries that are almost necessities. It was the salt much more than the medicine that induced so punctilious an attendance on Saturdays, and backsliding in any direction could usually be corrected by the mere threat of cutting the salt ration of the person concerned.

Stream Clearing.

The greatest difficulty experienced in the settlement was in clearing the streams and maintaining them fly-free. The settlement was a network of streams and altogether ten miles of them had to be cleared. These streams were all alike, trickling along a boggy bed which was often 200 yards across and covered by dense vegetation, creepers and tall trees. Three months after clearing there would be a fresh growth six feet high with Glossina palpalis re-established. In 1924 an attempt was made to deal with the situation finally.

It happened that about 12 acres of lawn grass (Cynodon transvaalensis) had been established round the houses and offices of the headquarters of the settlement. The ease with which this grass could be grown, its rapid spread and its destructive effect on other vegetation had been observed, and experiments to establish it in the bed of a stream had also been successful. Therefore a large gang of hired labourers was employed, and every able-bodied person in the settlement mobilised. Stream by stream all vegetation except the tall trees was dug up by the roots and piled high on the banks to rot, and grass from the lawns planted in its place. The method of planting it was to dig up long strips about one inch below ground level and then to tear off patches the size of a man's hand and to plant them about two feet apart. In a month each piece was sending out runners and in two months all had joined together.

At first an immense amount of weeding was necessary to prevent the young grass being choked, and the boggiest places had to be drained, but the results justified the labour. Left to itself this grass in time becomes swamped by other vegetation and periodic clearing is necessary, but the work of maintaining the streams clear is reduced by seventy-five per cent. Not only were the settlement streams planted, but orders were issued that all clearings in the district were to be treated in the same way. Chiefs sent up parties to collect the grass from the settlement. All the lawns of the settlement were dug up thirty times that wet weather and yet they grew again : before the dry weather the grass was established all over the district.

Statistics.

As stated in the beginning of this report there have been 5,450 cases treated in the Sudan to the end of 1929.

Six districts of two provinces have produced cases, and the area in which these have been found is nearly 1,000 miles in length :—

Mongalla Province.			Bahr El Ghazal Province.		
Yei.	Kajo-Kaji	Nimule.	Tembura.	Yambio.	Western District.
738	837	123	3,648	31	73
	1,698			3,752	
		Total 5,450			

Of the 1,698 cases treated in Mongalla Province 990 died and 546 were discharged as cured and only 23 of these have had to be readmitted with signs of the disease.

In Southern Bahr El Ghazal the largest number ever undergoing treatment at one time at Source Yubo was 1,837 in March 1925. Of the total 3,648 admitted to Source Yubo from 1918 to 1929, 1,661 died and 928 were discharged as cured, but 152 of these had to be readmitted with signs of the disease.

In neither the Western nor Yambio District of the Bahr El Ghazal was the disease ever allowed to take on epidemic form.

Some useful experimental treatment has been carried out in both Provinces, but accurate clinical observation on a big scale was impossible with a limited staff whose efforts were devoted to the control and extirpation of the disease.

Summary.

Measures taken in time shut out infection from two districts of Bahr El Ghazal whose combined area is seven times as large as Wales.

Where the disease obtained a footing in Yei District of Mongalla Province, an adequate staff was able to bring a considerable epidemic under control in the space of two years, but further east the disease lingered because the staff was depleted.

In Tembura District of Bahr El Ghazal where a serious epidemic became established, an inadequate staff could not in four years even arrest the spread of the disease, but when an adequate medical and administrative staff was provided, and the habits of the people changed, the epidemic was controlled within three years and the disease almost eradicated in the space of six.

The maintenance of fly-free streams was aided by the planting of 'Cynodon transvaalensis.'

The habits of a people were transformed without causing resentment.

Segregation was best effected in a Settlement where patients lived with their relatives, growing their own crops around homesteads of their own, and thereby becoming self-supporting in the space of two years.

(Sgd.) **G. K. MAURICE.**

SYPHILIS.

Very large numbers of persons suffering from this disease are treated at the hospitals and dispensaries throughout the Sudan. As the number of dispensaries is increased an increasingly large percentage of cases receive treatment in the acute stage. It is believed that with the exception of certain areas, the incidence of new infection is decreasing, but it is not possible to give figures to support this view. The primary object of treatment is to diminish the number of cases of syphilis that are in an infectious state and thus to diminish the number of new infections.

No cases of cerebro-spinal syphilis were reported during the year.

TRACHOMA.

This disease occurs among school children throughout the northern and central Sudan. With the exception of Halfa and Dongola Provinces it is mainly a disease of towns, and as such is liable to be spread among the children of the villages by the contact established in schools. Every effort is made to ensure the effectve treatment of the children at the schools. Treatment is adequately supervised in the primary and elementary vernacular schools, but treatment in most of the village schools does not at present receive sufficient supervision This is a question of staff, time and distances.

In the provinces other than Halfa and Dongola the question is primarily one of treating infected cases in schools so as to prevent the disease being spread among the village population. In Dongola and Halfa on the other hand the whole child population is affected. In Halfa the infection rate in the schools is over 90 per cent. In Dongola it is between 50 and 60 per cent. The difference in the latter province is due to the fact that in Halfa it has not been possible to carry out medical work in the villages and village schools, whereas in Dongola during the last four years this has been done to an increasing extent.

It is found in Dongola that the boys who have been cured of the disease return after their holidays reinfected. In these two provinces where the whole child population is infected, no method of dealing with the problem can be effectual which does not involve the treatment of the children in the villages as well as in the schools. A commencement has been made in this respect in Dongola by increasing the number of sanitary barbers and by employing them on this work, but the number available for this work is still insufficient. The matter is important as the disease is a very disabling one, and if treatment is to be carried out it is essential that it should be rendered effective by being established on a wider basis.

TUBERCULOSIS.

A total of 624 persons was admitted to hospital for this disease : of these 18 were not natives of the Sudan. Of the total, 302 were suffering from pulmonary tuberculosis and 322 from other forms of the disease.

Table " A " shews the total number of admissions for tuberculous disease, both pulmonary and non-pulmonary, for each of the years 1918 to 1929, and the percentage rate of tuberculous cases in relation to total admissions for each of these years :—

Table " A."

1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929
216	191	219	220	234	251	290	292	371	404	497	624
Percentage of total admission rate											
1.5	1.4	1.3	1.35	1.38	1.46	1.46	1.46	1.71	1.55	1.57	1.35

It will be seen that the percentage rate for 1929 is the lowest since 1922. It will be interesting to see if this is an isolated incident or the commencement of a downward movement. There has been a steady rise of this percentage since 1921 which was attributed to closer diagnosis. The position as regards the northern and central Sudan does not appear to be a cause for anxiety.

Table " B " shews the total number of admissions of pulmonary and non-pulmonary tuberculosis separately since 1922 and their percentage incidence to total admissions :—

TABLE " B."

	1922	1923	1924	1925	1926	1927	1928	1929
Pulmonary ..	140	123	159	135	175	226	260	302
Non-pulmonary ..	94	128	131	157	196	178	237	322
	Percentage of total admissions.							
Pulmonary ..	.82	.72	.66	.72	.80	.86	.82	.65
Non-pulmonary ..	.56	.78	.80	.84	.91	.69	.75	.70
TOTAL ..	1.38	1.46	1.46	1.46	1.71	1.55	1.57	1.35

The steady general improvement in the standard of nutrition and to a less extent of housing, the increasing facilities for the treatment of malaria and other debilitating diseases which may act as predisposing causes, should all result in a greater resisting power to this disease. It is notable and encouraging that an examination of 12,008 school children did not reveal any cases of tuberculosis, either pulmonary, or non-pulmonary.

An endeavour has been made to follow up the cases of pulmonary tuberculosis notified at Omdurman during 1927, 1928 and 1929.

The figures are shewn below :—

YEAR.	Cases notified.	Lost trace of.	Died.	Remaining
1927	9	3	1	5
1928	15	5	6	4
1929	9	2	4	3

Thus of 33 cases notified it has been possible to keep in touch with 23. Of these 11 have died, 4 are in good condition and are free from tubercle bacilli, 8 still have active disease and in at least two of these the prognosis is bad. It is of interest to note that of the four cured cases, two did not receive any special treatment. It is also seen that of nine cases notified in 1927 of whom six have been traced one only has died. Of the five survivors, two have made spontaneous cures, one is in good condition and one in fair condition.

These figures, although too small to admit of generalisations, would seem to suggest that pulmonary tuberculosis in the Sudan does not, as has been stated, invariably run a rapidly fatal course. Further observations on these lines are needed.

TUBERCULOSIS AMONG THE NEGROID RACES IN THE SOUTHERN SUDAN.

(a) Upper Nile Province.

In the course of a medical survey of the Shilluk tribe—a negroid tribe living on the banks of the White Nile between the 10th and 12th parallels—90,000 persons came under observation. Of these 23 were found to be suffering from pulmonary and 22 from non-pulmonary tuberculosis.

In a medical survey of the Lau and Gaweir Nuers—living between the Sobat and Zeraf rivers, roughly between the 7th and 9th parallels—9,500 persons were examined. Among these, no cases of pulmonary tuberculosis, three cases of glandular, and eight cases of bone and joint tuberculous cases were found. A similar survey of the Shish Dinkas—a negroid tribe living on the west side of the Jebel river between the 6th and 7th parallels—was carried out and 30,000 persons came under observation. Among these, two cases of pulmonary tuberculosis and no cases of glandular or bone tuberculosis were detected.

On the other hand, among 404 Nuer prisoners who were detained in a camp outside Malakal from April to the end of the year, ten cases of pulmonary tuberculosis occurred. The Von Pirquet tuberculin reaction test was carried out on 360 of these Nuer prisoners and 121 cases were undoubtedly positive. It is proposed to carry out the same reaction on men of the same tribe living under natural surroundings.

It would appear from these figures that tuberculosis is nowhere common among the negroid tribes of the Upper Nile Province, but that it is commoner among the Shilluk tribe, who are more settled, than it is among the Nuers and Dinkas further south, who are less settled, and who come less in contact with town life. The high incidence of this disease among the Nuer prisoners, in spite of the fact that every effort was made to reproduce as far as possible the more favourable conditions of their normal life, would point to the fact that under conditions of depression and confinement they fall easy victims to this disease.

(b) Bahr-el-Ghazal Province.

71 cases of tuberculosis were reported from this province. Of these 42 were pulmonary and 29 non-pulmonary. Two of the pulmonary cases were northerners, the other 69 were natives of the province.

(c) Mongalla Province.

Only one case of tuberculosis was notified in this province, and he was a soldier.

(d) Nuba Mountains District.

No cases of tuberculosis came under observation from among the Nuba population of this district. The Nubas are a negroid race, hill men, deep chested, heavily muscled and well nourished.

SUMMARY.

In the Upper Nile Province certain tribal sections have been carefully examined and the incidence of tuberculosis has been found to be low, but the heavier incidence among Nuer prisoners suggests that altered, and, in particular, depressing conditions of life, might lead to a dangerous increase of this disease. In the Nuba Mountains district, the Nubas, a well developed and well nourished people, appear to be singularly free from tuberculous infection. It would be unwise to draw any conclusions from the limited observations carried out in the Bahr-el-Ghazal and Mongalla Provinces.

TYPHOID FEVER.

The incidence of typhoid and paratyphoid fevers was lighter generally throughout the Sudan. A total of 86 cases was recorded as against 132 cases in 1928 and 52 cases in 1927. Of the 86 cases reported 56 occurred in Khartoum, Khartoum North and Omdurman. These cases occurred throughout the year. In the rest of the Sudan the cases occurred sporadically, distributed over eight provinces.

The following list shews the distribution of the cases :—

PLACE.	Europeans.		Natives.	
	Admitted.	Died.	Admitted.	Died.
Khartoum	—	—	15	1
Khartoum North	—	—	11	—
Omdurman	—	—	30	3
Atbara	—	—	7	1
Port Sudan	3	—	1	1
Suakin Quarantine	—	—	1	1
Wadi Halfa	—	—	1	—
Wad-Medani	1	—	6	1
Makwar	—	—	2	1
Merowe	—	—	2	—
Dongola	—	—	1	—
Kassala	—	—	3	—
Gedaref	—	—	2	2
Malakal	1	—	—	—
Yei	—	—	2	1
Dueim	—	—	2	1
TOTAL	5	—	86	13

YAWS.

This disease occurs chiefly south of the 9th parallel. As regards the Upper Nile Province there is definite evidence pointing to a diminution in the incidence and severity of the disease as a result of treatment. This is also true of the sleeping sickness areas of Mongalla Province. In the rest of Mongalla and in the Bahr-el-Ghazal Province large number of cases are coming under treatment.

The primary object of treatment is to diminish the number of infectious cases and thus to decrease the spread of infection.

PROGRESS IN MEDICAL WORK.

There was a large increase in the numbers of inpatients and outpatients who came under treatment in the course of the year, the increases being:—

Inpatients.	Out patients.
6069	670,802

The outpatients totals are total attendances.

The following list shews the increases in inpatients and outpatients attendances over the last five years:—

	1925	1926	1927	1928	1929
Inpatients..	3,785	5,225	5,373	6,557	6,069
Outpatients	209,130	421,834	432,838	546,577	670,802

The most marked increases in outpatient attendances during 1929 were in the following provinces:—

Kordofan	115,000
Darfur	92,000
Kassala	56,000
Dongola	99,000
Bahr-el-Ghazal	60,000

The following additions to buildings were made during 1929:—

Khartoum Province.

Khartoum hospital. New isolation wards.
Extension to nurses' quarters.
Provision of ground floor sleeping platforms.
Re-arrangement of surface drainage.
New dressing store.

Kassala Province.
Kassala hospital.
12 bedded 3rd. class ward.
Water system to kitchen and wash-house.
Kitchen store.
Staircase to 1st class ward.
Kitchen to prison ward.

Khatmia dispensary.
Two mud tukls.

Kassala station.
Two brick tukls.

Showak dispensary.
Four brick tukls.

Hawata dispensary.
Four brick tukls.

Doka dispensary.

Four brick tukls.

Gedaref hospital.

Operating theatre block.
20-bedded 3rd. class ward.
Two brick tukls.
Wire fence round hosh.

Kordofan Province.

El-Obeid hospital.

Operating theatre, preparation and anaesthetic room.
8-bedded 2nd. class ward.
2-bedded 1st. class ward.
Two bathrooms and annexes.
Operating theatre.
3rd. class ward.
Kitchen and laundry block.
Two attendants' rooms.

Sodari dispensary.

New 3-roomed dispensary.
Old dispensary converted into wards.

Bara dispensary.

New mud-brick dispensary.
Dispensary hakim's house.

Rahad dispensary.

3 permanent tukl wards.
Dispensary hakim's house.

Um Ruwaba dispensary.

3 permanent tukl wards.
Dispensary hakim's house.

Rashad dispensary.

Two new tukl wards (cement floored).

Talodi dispensary.

Conversion of old building to dispensary.

Dilling dispensary.

Outpatient block.
New kitchen.
Four tukl wards.

Dongola Province.

Merowe hospital.

Male ward.
Male isolation ward.

Merowe hospital (*Contd.*)

Pathological laboratory.
Latrine and bed-pan room.
Clerk's office.
Dispensary.
Female ward.
Attendants' room.

White Nile Province.

El-Dueim hospital.

Out-patient accommodation.

Fung Province.

Roseires hospital.

12-bedded women's ward.

Singa hospital.

New infectious block of two rooms.
Brick bath-house.

Berber Province.

Zeidab dispensary.

Two-roomed dispensary.

Mongalla Province.

Meridi dispensary.

4-bedded brick ward.
Outpatient room.

Upper Nile Province.

Malakal hospital.

23-bedded hospital block and annex.
Hospital water supply.
10 attendants' tukls.
Venereal clinic.
Electric light supply.
Latrines to 2 hospital blocks.
Bathroom to one block.

Darfur Prvince

El-Fasher hospital.

General repairs to hospital.

Nyala hospital.

New operating room and store block.
6 mud and grass wards (6-bedded).

Geneina dispensary.
Um Kedada dispensary.

PROGRESS IN CERTAIN PROVINCES.

Darfur Province.

The people of this province were practically untouched by medical work up to the outbreak of the relapsing fever epidemic in 1926. Since that time medical work has been mainly anti-epidemic work, directed first against relapsing fever, and during the last year against a severe epidemic outbreak of small-pox. In order to win the confidence of the people and to obtain early information as to the outbreak of disease, eight dispensaries have been opened during the year. Six of these were opened during the early part of the year, and two during November and December. A large number of sick have been seen at these dispensaries, which are becoming increasingly popular.

The province is very exposed to the introduction of epidemic diseases from its western border, and every effort will be made to increase the number of these dispensaries until outbreaks of disease can be immediately recognised and reported from every part of the province.

Kassala Province.

Although medical work had been well developed in the eastern part of the province by the establishment of fixed dispensaries for the settled Arabs and by travelling dispensaries for the Nomads, up to the latter part of 1928 it had not been possible to open up the western district to medical work. This had become a matter of urgency because the western district-which is subject to the introduction of epidemic diseases from across the Abyssinian border—had been recently brought into rapid communication by rail and motor car with other parts of the Sudan, and it was therefore important that it should be brought under medical supervision and medical control. During 1929, a commencement has been made in this direction. The dispensary at Gedaref has been enlarged and converted into a small hospital, and dispensaries have been established at three important points in the district.

The total number of inpatients and outpatients treated in this area during the last three years is as follows :—

	1927	1928	1929
Inpatients	239	682	1,810
Outpatients	9,053	26,112	63,116

Upper Nile Province.

The medical penetration of this province has continued throughout the year. The concentration of the Lau and Gaweir Nuers during the dry weather in defined areas between the Sobat and Zeraf rivers threw heavy additional duties on the medical staff, and has to some extent interfered with the routine medical work of the province, but it has resulted in these wild and intractable people who had previously been little reached by medical work being brought during the period of concentration within easy reach of medical attention which was freely extended to them.

In so far as the circumstances permitted, a medical survey of these tribes was carried out and a summary of the results is given below. The medical inspector who carried out a survey of the Shilluk tribe in 1928 has this year (1929) completed that survey and carried out a survey of the Shish and Atwot Dinkas, but in neither case was it possible to make the survey so detailed as before. Summaries of these surveys by the reporting medical inspector are given below.

The Shish-Dinkas a few years ago were in a most miserable condition owing to the mutually interacting causes of disease (chiefly Yaws) and malnutrition. The condition of this tribe has improved during these few years to an extent that amounts to a tribal transformation, but the general physical condition is still far below that of the Shilluks and of most of the Nuer tribes.

It has been possible in the course of the year to recommence medical work in the western Nuer district which was discontinued in 1927 as a result of tribal unrest. At the time of the cessation of medical work all persons showing signs of active infection with Yaws in the Lake Jor area had been treated with Novarsenobenzol. This treatment was carried out systematically in accordance with a census of the population. It is interesting to note that in reopening the district in 1929 this area was found to be almost completely free from any active manifestation of Yaws, although originally it had been very heavily infected.

THE NUER CONCENTRATION.

The following is a summary of a medical survey which was carried out on the Gaweir Nuers and the Mor and Gun sections of Lau Nuers. They were concentrated in three separate defined areas situated in the wide plain stretching between the Zeraf and the Sobat rivers and between the 7th and 9th parallels. The Mor section was concentrated near to the Sobat river; the Gun section on a ridge of land between the two rivers, and the Gaweir Nuers on the Zeraf river.

The numbers examined were :—

	Total.	Men.	Women	Children.
Mor	3,000	700	600	1,700
Gun	2,000	300	600	1,100
Gaweir	4,500	840	1,015	2,645

No epidemics occurred, nor did the health of the tribesmen suffer in any way from the concentration. On the other hand all existing sick were treated, and in this way the general health was considerably improved.

The sickness rates for the three sections were :—

	Per cent.
Mor	34.9
Gun	35·0
Gaweir	15·6

General Health.

The general health of the Gaweir Nuer is specially commented on by the Senior Medical Inspector, as being surprisingly good.

He says "the physique of the young men is remarkable and definitely of a higher standard than one meets with in other parts of the Nuer country. Their limbs, chests and abdominal muscles are enormously developed. It is suggested that activity in a country that is swamp for three quarters of the year, together with a liberal fish diet, are factors which contribute largely to this state of physical fitness."

Birth Rate.

Enquires into the birth rate for the three sections lead to the following conclusions :—

(i) the average woman bears six to eight children,
(ii) 50 per cent. of these children die before they reach puberty and the majority of deaths take place during the first three years of life.

Miscarriages.

It is very difficult to obtain accurate information on this subject, but the incidence does not appear to be higher than among Europeans, and this in spite of the widespread infection with Yaws, which apparently does not affect the child in utero.

Death Rate.

This is very high among children. 50 per cent. of the children born are said to die before they reach puberty.

The chief causes are :—

(i) Malaria.
(ii) Infantile diarrhoea.
(iii) Broncho-pneumonia.

Of these, malaria is by far the commonest cause.

Yaws.

The incidence of this disease is given as follows :—

	Per 1000.
Mor	227
Gun	159
Gaweir	156

The proportion of primary and secondary manifestations to tertiary in the three sections was as follows :—

Among the Mor	1	to	10.
,, ,, Gun	1	to	1.
,, ,, Gaweir	1	to	5.

The most prevalent bone condition was pain in the bones, general in adults and confined to both tibiae in children.

Malaria.

This was the non-malarial season. Cases of clinical malaria were very few in all three areas and occurred chiefly in children. The splenic index was as follows :—

	Adults. Per cent	Children up to 14 years. Per cent
Mor	1	22
Gun	2	25
Gaweir	2	10

Among the Mor the infants in arms shewed a spleen rate of 25 per cent.

Splenic enlargement occurred at a very early age and was more prevalent in the years 1 to 6.

Among the Mor 200 slides were taken for microscopical examination. These were taken from the clinical cases and from the youngest children with the largest spleens. Thirty per cent. were positive.

Benign tertian	50
Malignant tertian	4
Quartan	6

In each case parasites were very scanty and each slide had to be examined for an average of 5 to 10 minutes. In fully three-quarters of the positive slides sexual forms were, comparatively, very prevalent and at least 50 per cent. of cases occurred without any schizonts at all being present.

Guinea Worm.

Only six cases came under observation. These were probably all infected in the pools near Duk Fadiat.

Eye Diseases.

Chronic conjunctivitis was very common in all three sections. It is probable that the chronic irritation set up by the dense smoke of the huts acts as a predisposing cause and is followed by infection. Corneal opacities and trichiasis are common sequelae.

Tuberculosis.

The following table shews the number of tuberculosis cases detected among the three sections, *i.e.*, in a total of 9,500 persons examined :—

	Pulmonary Tuberculosis.	Glandular Tuberculosis.	Bone and Joint Tuberculosis.
Mor	Nil	Nil	Nil
Gun	Nil	Nil	2
Gaweir	Nil	3	6

This bears out previous observations made in other sections of the Nuers to the effect that pulmonary tuberculosis is very rare among this tribe.

Respiratory Diseases.

Chronic bronchitis was common in the Mor and Gun sections and a few cases of pneumonia came under treatment among the Gaweir.

Leprosy.

Only two cases were detected among the three sections.

SURVEY OF SHISH AND ATWOT DINKA.

These Dinkas inhabit a swampy country immediately to the west of the Nile (Bahr-el-Jebel) and lying between the 6th. and 7th. parallels.

Population.

The inhabitants in the areas visited number approximately 30,000.

General Health.

The general health of the people appeared to be of a low standard. Sickness among children was very prevalent, chiefly malaria and yaws. Amongst adults the sequelae of these diseases and guinea worm were all very common.

Birth Rate.

The average healthy woman bears from four to six children.

Death Rate.

This is very high amongst children especially in the first two years. Generally two or three children from each family die, the usual cause of death being apparently malaria. The span of life is much shorter than in the Shilluk country; adults commonly succumb to pulmonary diseases and septicaemic conditions.

General Diseases.

Tuberculosis. One case of clinical pulmonary tuberculosis was treated. This is the second case only in the district during the current year.

Gonorrhoea. A few cases were treated at Yirrol, but it appears to be confined to the Merkaz.

Syphilis and Yaws. No primary or secondary syphilis was seen. On the other hand primary yaws was extremely common in certain parts of the district. Of tertiary lesions, deformities of the tibiae and joint pains were commonest in children and clavus and ulcers in adults.

Congenital Lesions. Osseous deformities, malnutrition, and skin conditions occurred in several very young children, suggesting the transmission of yaws from the mother.

Ulcers. Yaw ulcers were fairly common. In the Atwot country a considerable number of khareef ulcers were treated.

General Bone Pains. This condition was very prevalent throughout the whole district.

Eye Diseases. No cases of trachoma were seen. Children universally suffered from conjunctivitis due to irritation by smoke and dust. Many cases of trachiasis presumably resultant from conjunctivitis were encountered. A few cataracts were seen.

Skin Disease. In some parts of the district scabies was very common, even though few clothes were worn. The parasite appears to lurk in the tukls.

A few cases of rupia were also treated.

Tumours. One benign and one malignant tumour were seen.

Dysentery. Very few cases of dysentery were treated. These were sporadic cases of subacute bacillary, probably Flexner, infections.

Malaria. This disease is universally prevalent.

The splenic index in children varied from 60 to 80 per cent. In adults on the other hand, the index was practically nil.

Slides taken for microscopic examinations differed from those taken in other parts of the province in that practically all shewed malarial parasites. These were taken from children with enlarged spleens.

Two or three children only were brought forward on account of malaria, also only a few adults complained of the disease. The slides were taken from children of all ages and parasites were demonstrated in practically every case. Benign tertian was by far the most universal parasite results being :—

	Per cent.
Benign tertian	90
Malignant tertian	6
Quartan	Nil
Slide negative	4

Mosquito Density. Mosquitoes were worse at Yirrol than in any other part visited. On examination about 80 per cent. were anopheline and many of these appeared to me to be Anopheline funestis, probably the chief malaria carrier in the province. Outside Yirrol mosquitoes were not very thick and culicine were as prevalent, often more so than anopheline. Mansonia uniformis was commonly found.

Guinea Worm. In some parts of the district the incidence of guinea worm was as high as 50 per cent. The disease occurred chiefly in adults, and was in all cases intimately associated with water supply. It was found that water in heavily infected areas was drawn from deep pools and shallow wells which do not readily dry up. In adjacent areas where water was drawn from quickly drying pools or from khors which likewise emptied themselves early, there was no guinea worm. Also it was observed that when water was obtained from deep wells there was no guinea worm.

The disease is everywhere most prevalent in the khareef. This corresponds with the usually accepted incubation period of about six months, as the initial infection presumably occurs in the dry weather.

Interrogation of the native chiefs elicited the fact that spontaneous cure usually occurred in 6—12 months after the appearance of the lesion, but that reinfection readily occurred. It is interesting to note that the natives consider that the disease is contracted by eating the mud-fish called in Arabic "Garmut."

Leprosy. This disease is more prevalent in the district than was originally supposed. I personally saw about 30 cases and from conversation with the chiefs I put the total number at about 75. Four early cases were seen, including two children. A further six active cases of mixed type presented themselves. The rest were all old burnt-out cases.

Circulatory System. No cases of cardiac involvement were treated.

Respiratory System. Bronchitis was very prevalent throughout the whole district. Two cases of pneumonia were treated.

Alimentary System. No serious disease of this system was seen. Hernia however is a common condition. At least a dozen operable cases were seen.

Nervous System. No nervous diseases were seen.

(Sgd.) **L. H. HENDERSON, M.D.**

SHILLUK SURVEY.

The area examined was from Kodok northwards to the end of the Shilluk country, *i.e.*, an area on the west bank of the Upper Nile river lying approximately between the 10th and 11th parallels.

Population.

The population numbered approximately 40,000.

General Diseases.

These have been tabulated as before.

Tuberculosis. There are very few cases of this disease among the northern section of the tribe. One case only of pulmonary tuberculosis in an adult—and two cases of tuberculous (?) adenitis in children were encountered.

Gonorrhoea. This disease emanated from the Merakiz of Kodok and Kaka. No cases were seen outside these administrative centres.

Syphilis and Yaws. Four primary chancres were treated, all in men. Eleven cases of primary yaws were treated most of these occurring at muco-cutaneous junctions such as the vulva, foreskin and lip. Tertiary lesions were as usual very varied. The most universal lesion in children was pain in both tibiae usually with some deformity.

Congenital lesions were comparatively rare.

Few ulcers were treated and most of those appeared to be tertiary syphilitic or yaw lesions.

General Bone Pain. In cases of this complaint the antecedent history was gone into. Only 10 per cent. of cases gave a definite history of yaws. More than 30 gave a history of frequent attacks of fever.

Eye Diseases. These consist of conjunctivitis, trichiasis and corneal opacities in the ratio of 30.2.1. Both the last two would appear to originate in most cases from the first. No trachoma was seen. Smears were taken from most cases of purulent conjunctivitis, but with microscopic examination only, no definite organism could be implicated.

Skin Diseases. Many of these occurred in the scalp and were probably extensive impetigo.

Wounds. These include contusions, spearwounds, burns and mauls of several kinds. No congenital deformities were seen in the north.

Tumours. The four tumours seen were two lipomas, one ganglion on the foot and one tumour of the parotid. No malignant tumours were encountered.

Malaria. The observations made more or less confirm those of the earlier part of the survey. The splenic index in adults shewed a slight increase in females: in children the index was considerably higher than in the south. This may be attributable to the fact that a considerable amount of rain had fallen and many of the children had had recent attacks of malaria. The initial part of the survey was made before the onset of any rain when presumably the majority of the children examined had had no fever for several months.

Microscopically, malignant tertian predominated. Unfortunately the inclemency of the weather destroyed over a gross of specimens which had been taken for further examination in Malakal.

Mosquitoes: Mansonia uniformis everywhere predominated. The chief malaria carriers have however not yet been determined.

Gastro-Enteritis of Children. This disease appears to be prevalent throughout the whole Shilluk country. The hopelessness with which the natives regard this condition shows that it has up to now been nearly always fatal.

Leprosy. Sixteen cases only were found.

Early: One case only, a female at 40, suffering from mixed type of one year's duration.

Active: Four males and one female average age 40 suffered from mixed leprosy of 2 to 4 years' duration.

Burnt out: Four males and six females, aged 50-60, were old burnt out case of 5 to 10 years' duration.

Respiratory System. Two cases only of pneumonia were treated, all the others being cases of bronchitis.

Alimentary System. These were all minor ailments of the gastro-intestinal tract.

Nervous System. One case of sclerosis and one of facial paralysis only were treated.

Vaccination. Vaccination as before proved very popular. Unfortunately the results were rather disappointing.

SUMMARY.

The general health of the northern Shilluk is better than that of the southern.

Tuberculosis is less prevalent in the north.

Gonorrhoea is contracted in the Merakiz.

Syphilis exists but is not nearly so prevalent as yaws.

Tertiary lesions of either disease cannot in many cases be differentiated.

The etiology of general bone pains shews a great predominance of malaria over yaws as an antecedent.

Benign tumours only were seen.

The splenic index of children is high.

Malignant tertian is the predominating parasite.

Gastro-enteritis of children is a very fatal disease.

The incidence of leprosy compares very favourably with that in other parts of the Shilluk country.

(Sgd.) **L. H. HENDERSON, M.D.**

MEDICAL WORK CARRIED OUT BY MISSIONS.

Omdurman.

The Church Missionary Society hospital at Omdurman continued to carry out very useful medical work. The hospital has accommodation for 17 male inpatients and 18 female inpatients.

The staff consists of :—

2 male doctors.
1 lady doctor.
3 nurses.
1 lady housekeeper.

The total inpatients for the year was 736 ; the total of outpatient attendances was 19,505.

In addition to the hospital work, the Mission staffs a dispensary in a distant part of the town, and carries out the treatment and nursing work at the Government leper hostel (See leprosy page 20). The Government is very indebted to the C.M.S. hospital for the excellent work carried out at this hostel.

Mongalla Province.

The C.M.S. hospital at Lui, in Mongalla Province, continues to carry on excellent work under Dr. Fraser.

A total of 3,872 cases were treated during the year. 104 major operatons were performed, and 920 cases of yaws and syphilis received injections of Novarsenobenzol. A new block for women and children, consisting of a small ward and an operating theatre, is in course of construction.

A leper settlement is also carried on. The numbers under treatment vary from 150 to 180. A leper hospital, consisting of a dispensary and two small wards, was completed in the course of the year.

Upper Nile Province.

The Sudan United Mission has a dispensary at Melut under Dr. Trudinger with a branch dispensaryat Rom, under a British dispenser.

The Church Missionary Society has a dispensary at Akot, between Rumbek and Yirrol, under Dr. Macdonald. These missions are working in co-operation with the Medical Service in this Province.

The Austrian Mission has sent four boys to the hospital at Malakal to be trained for dispensary work. One of these has completed his training and is in charge of a mission dispensary at Yoynyang The other three will be placed in charge of mission dispensaries as soon as they have completed their training.

HEALTH OF THE IRRIGATED AREA OF THE GEZIRA

Seven new blocks came under cultivation in the autumn of 1929, thus increasing the total area from 394,000 to 505,000 acres. This extension of 111,000 acres represented a largely increased sanitary responsibility. Additional medical and sanitary staff was provided, and dispensaries were equipped and staffed in each of the new blocks.

The extension being to the north, involves an area of lower rainfall, and thus it escaped the more serious results of the exceptional rainfall, which were very marked in the south and centre of the irrigated area.

Malaria in the Gezira.

The rains were heavy and continuous from July to the middle of September.

The rainfalls recorded in the southern, central and northern areas for the last three years are as follows :—

	Southern.	Central.	Northern.
	ins.	ins.	ins.
1927	17.7	14.6	14.7
1928	10	11.2	8.9
1929	25.9	21.2	18

Large areas of the Gezira were flooded for weeks together, and broad sheets of water remained in the low-lying areas for much longer periods. As a result of this exceptional rainfall, malaria became widely endemic throughout the Gezira. Epidemic conditions commenced early in September and prevailed until the colder weather set in early in December. Greatly increased numbers of malaria cases were treated at the Wad Medani hospital and all the dispensaries.

A feature of this year's epidemic was the high proportion of malignant infections. Almost all the mosquitoes that bred out during the rainy season were anopheles. It was very rare to find culicine larvae.

In spite of the almost universal incidence of malaria among the native population, the incidence among the British population was much lower than in previous epidemics. Thus, British admissions for malaria in 1927 were 61, and in 1929 were 41, whilst the incidence of native malaria cases treated rose from 7,794 in 1927 to 18, 354 in 1929.

This relative freedom from malaria amongst the British population can be attributed to the careful execution of the detailed measures prescribed for the protection of the British staff and their servants. These measures included the routine treatment of the servants with plasmochin, and the universal issue of mosquito-nets to servants.

In 1928, an issue of mosquito-nets against payment had been made to all tenants for themselves and their dependants. The results of this issue had been excellent. In 1929, in spite of the urgent representations of the medical authorities this issue was discontinued. It was very unfortunate that this should have been the case in view of the heavy rains and the epidemic conditions that ensued.

The effect of irrigation on epidemic and endemic malaria.

It is well perhaps, to make clear to what extent malarial conditions in the Gezira have been affected by canalisation and irrigation. Owing largely to the impermeable nature of the soil, and to its extreme flatness and lack of natural drainage, the southern and central parts of the Gezira have always become swampy whenever the rainfall was heavy, and as a result malaria has been widely epidemic at these times.

Before irrigation was carried out epidemic malaria generally died down during December, and the people were not subject to reinfection before the next rains. Thus, malaria was often epidemic, but it was not endemic, and the people had eight months of the year to recover from the effects of infection.

These epidemic conditions up to the present have not been materially affected by irrigation. The very limited natural drainage that existed before has in places been interfered with by the canalisation, but this has been more than compensated for by the greater facilities provided for treatment, and by the anti-mosquito measures that it is possible to take towards the latter end of the rainy season.

The essential difference is that before irrigation had been carried out infection ceased as soon as the water had dried up and the cool weather had set in. Now although it is possible under favourable circumstances to keep the irrigated area relatively free of mosquitoes, yet if epidemic conditions have prevailed during the rainy season, the debilitating effect on the people is such that it is difficult to enforce the routine anti-mosquito measures which are necessary to prevent mosquito breeding. Moreover as a result of the epidemic conditions human reservoirs of the disease are numerous in every village, and are a potential source of infection for the mosquitoes. In this way, malarial conditions may extend over into the dry weather, and malarial infection may become endemic.

If therefore malaria is to be kept from becoming an endemic disease in this area throughout the year it is essential to deal with epidemic conditions which have always been liable to prevail during the rainy season.

The measures already adopted are calculated to diminish this incidence, but not to prevent it. These are :—

(i) The multiplication of dispensaries throughout the area, thus bringing. free and prompt treatment within reach of everyone within the area;

(ii) The wide distribution of mosquito-nets.

(iii) Anti-mosquito measures as soon as the flooded areas diminish, and it is possible to get about.

If however, these widespread epidemics are to be prevented it will be necessary to ensure effective surface drainage over this area. The matter is one of considerable difficulty owing to the flatness of the land, and the fact that the greater part of the area slopes away from the Blue Nile. A limited scheme of surface drainage was commenced in 1928, but although this did something to alleviate the flooding in certain areas it was quite unable to cope with the exceptional conditions in the autumn of 1929. This system of surface drainage, partly by drains discharging by gravity and partly by drains pumped back into the larger canals, is being further extended and it is hoped that the portion of the programme to be completed before next autumn will prove effective, in preventing serious flooding.

Until these seasonal epidemics of malaria can be prevented by really effective surface drainage it will be impossible to prevent malaria from becoming endemic, and there will be a grave danger of the people becoming progressively malarialised.

Village Sanitation. In 1923 the population of the area which was then to be irrigated was estimated at a total of 35,600 settled Arabs. In 1929, the population of the same area was estimated to have increased to 72,000 settled Arabs together with a permanent immigrant population of 5,734, making in all a settled population of over 77,000 and in addition to this a seasonal population of immigrants of over 36,000. Thus the settled population has been more than doubled, and during the cotton picking season there is a further immigration of some 36,000 persons.

This large increase in population has rendered the provision of some sort of village conservancy a matter of importance. Every means is taken to discourage the fouling of the canals with urine and faeces, by propaganda, by religious and by Government regulations, but it will be impossible to prevent the fouling of these canals until latrine accommodation has been provided in the villages. Moreover, with the growth in size and population of the villages there is a tendency for the soil around the villages to become increasingly fouled by human excreta. The figures given below suggest a progressive increase in the incidence of dysentery which may well be attributable to this condition of affairs :—

	1925	1926	1927	1928	1929
Dysentery incidence in the irrigated area ..	304	361	437	864	777

SANITATION.

Port Sudan (Sanitation).

A new factor has been introduced by the establishment of various works coal docks, oil distribution works, and salt works) on the tongue of land situated to the south of the west town and separated from it by an arm of the harbour, and lying between this arm and the open sea.

Sewage disposal in this new area for European houses and for labourers is by septic tanks and bucket latrines.

A dispensary has been opened there for the treatment of the workers.

Conservancy, Port Sudan.

There are 31 septic tank systems in use, and three more are under construction. There are also 33 cesspools with water closet connections. Cesspools are only allowed to drain one water closet. When two or more closets have to be dealt with septic tanks are installed. In either case the final effluent is dealt with by soakage through coral.

No trouble has been encountered from failure of soakage from cesspools or from septic tanks, where only a small number of closets have had to be dealt with, but where a large number of closets are connected with a single system, soakage has not kept pace with the intake. It would probably be unwise to increase the number of cesspools and septic tanks much further in the part of the town lying near to the sea where the subsoil water is at a high level, and where contamination of this subsoil water is likely to occur if the effluent is largely increased ; but in the native quarters, at a considerable distance from the sea it will probably be possible to develop the deep pit or augur bore latrine without any water-flushing system, and so to relieve the inconvenience and expense of a wide extension of the double-bucket system.

Experiments were carried out to compare the effects of fresh water and salt water respectively on the absorption of fluid from cesspools by soakage. The results of these experiments seem to indicate that the soakage through the coral is more effective where salt water is used. The efficiency of bacterial decomposition did not appear to be affected by the use of salt water.

Water Supply.

The fresh water supply from Khor Arbaat, a natural subsoil reservoir in the hills 20 miles from Port Sudan, has given satisfactory results.

Owing to the effect of four successive years of drought, the level of the water in the well at the headworks fell to the level of the outlet pipe. This difficulty was met by tapping the water supply higher up in the catchment area and leading it into the well. It was possible to maintain a constant supply of 1,600 tons a day throughout the year. This meets the immediate needs of the town. Of this total, 250 tons is supplied to gardens, and a considerable quantity is devoted to watering roads, and similar purposes, and to use in water closets. The bacterial and chemical analysis proved satisfactory. An additional length of 1,500 metres of ten-inch pipe will be laid during the coming year, so as to complete the reduplication of the pipe line from the headworks to Port Sudan.

Rats and Rat Flea.

Rat-proofing regulations were drawn up during the course of the year. These regulations are not retrospective, but considerable progress has been made towards rendering all private stores in the town rat-proof.

With one exception all the rats caught during the year were of the family Rattus Rattus. The division into sub-families was as follows :—

	Per cent.
Rattus Rattus Rattus	7.5
Rattus Rattus Alexandrinus	37.5
Rattus Rattus Frugivorus	55.0

One Rattus Norvegicus was caught in a wood warehouse soon after a new consignment of timber had arrived by sea. It is the only rat of this type known to have been caught at Port Sudan.

The total number of rats caught has fallen since 1928 in spite of the employment of a larger staff.

The totals for the last four years are as follows :—

1926	1927	1928	1929
1,884	3,731	4,807	3,791

The distribution was as follows :—

WEST TOWN.			EAST TOWN.		
Shops	Villages.	Other places.	Quays.	Villages.	Other places.
Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
26.9	17.9	8.9	10.9	22.7	12 .7

Rat Fleas.

The percentage of fleas per rat recorded in 1929 has greatly increased. This is due to an improved method of collection.

The following table shews the flea rate per rat for each month of the year together with the atmospheric conditions prevailing :—

MONTH.	Fleas per rat.	Average Shade Temp.		Average Relative Humidity Per cent.
		Max. F.	Min. F.	
January	3	81.3	69.2	62
February	2.5	82.4	66.9	55
March	4.4	84.4	68.3	62
April	4.5	89.7	72.8	55
May	4.8	99.5	77.9	40
June	2.2	102.0	78.9	34
July	1.1	107.0	84.4	35
August	0.3	105.8	85.6	37
September	0.4	100.7	80.2	49
October	2.0	92.3	78.1	65
November	3.9	88.5	74.5	64
December	2.9	81.9	66.9	41

The fleas caught at Port Sudan were of the following varieties :—

Xenopsylla cheopis	(Rattus	Rattus)
Ceratophyllus fasciatus	,,	,,
Ceratophyllus felis stronglyus	,,	,,

At Khor Hanoiett, near Port Sudan, Xenopsylla cleopatrae (Gerboa).

Mosquitoes.

There has been a predominance of stegomyia infections during the year. In past years these have always been in excess of culex and anophelene infections, but not to the same extent. In 1929 stegomyia infections were 70 per cent. of all those found, whereas in 1928 they were only 60 per cent.

The following is a record of the infections found during the year under report:—

MONTH.	Infections of		Species.			Total.
	Larvae	Pupae	Anoph.	Culex.	Steg.	
January	21	5	1	8	17	26
February	9	—	1	2	6	9
March	6	3	—	1	8	9
April	13	3	1	11	4	16
May	16	4	—	8	12	20
June	15	3	—	6	12	18
July	6	—	—	1	5	6
August	6	1	—	1	6	7
September	—	1	—	1	—	1
October	39	5	—	4	40	44
November	24	6	—	3	27	30
December	9	2	—	4	7	11
TOTAL	164	33	3	57	137	197

Quarantine Hospital.

A new quarantine hospital was completed during the year. It is situated in a convenient but isolated position on the border of the harbour inlet, to the north of the bridge. This is to replace the old quarantine hospital which was rendered useless by the development of the south side for industrial purposes.

REPORT
on the
HEALTH AND SANITATION
of
KHARTOUM PROVINCE 1929.

GENERAL.

The health of the population, both European and native, has been exceptionally good throughout the year.

In the earlier part of the year, anopheline infections were prevalent in all river pools, and during July and August unusually heavy rains and a high Nile were experienced and flies were abundant, but in spite of these, the incidence of both malaria and dysentery locally contracted shows a very satisfactory reduction.

The most important feature of the year has been the granting of additional funds by the Central Government for considerable increases to the staff and equipment of the Sanitary Services of the three towns and Rural District.

In Khartoum it has been found increasingly difficult to keep pace with the development of the town and to give adequate attention to such matters of importance as cleanliness of kitchen, servants' latrines, stables, waste water disposal in the European area and house to house inspection in the native area. In Omdurman and the Rural District, the staff were entirely inadequate to deal with the sanitation requirements of their respective areas.

A committee was appointed early in January to put forward proposals for improvements both to the amenities and public health services of the three towns in general and Khartoum in particular.

As a result of the discussions which followed, a whole time Medical Officer of Health has been approved, and the staff of this Service has been increased by the following personnel :—

British Sanitary Inspectors	2
Mechanical Foreman	1
Native House-to-House Inspectors	8
Other native staff including scavengers and mosquito men	62

In addition, the conditions of service for the British sanitary inspectors have been improved and certain of the native sanitary inspectors have been made pensionable in order to attract a better class of native to this type of work.

A sum of money was provided for improvements to the Belgravia Dairy for new milking byres and a bottle sterilising plant.

The provision for disinfectants has been increased to enable us to place two pints of diluted disinfectant in every conservancy bucket ; this is intended to act as a deterrent to flies and a deodorant when the carts are removing the buckets by night.

Three additional motor refuse lorries have been provided and one lorry to transport the Sanitary Inspector, Rural District, and his staff for dealing with river pool and farm inspections.

Additional bricklined drains were approved and have been constructed in Khartoum and Omdurman to deal with rain water.

With regard to amenities, which are so closely bound up with the health of Europeans in the tropics, the committee recommended the division of Khartoum into definite European and non-European areas ; such a division had to a large extent already existed, but with the rapid development of Government housing and to a less extent private building, the necessity for a more stringent division became advisable. As a result of this recommendation, two large blocks of mud houses, known as the Commercial Stables and Muraslat Quarters, are being demolished for further Government housing, and sites have been found for those dispossessed to the south west of the town.

A large open space in front of the Law Courts and the whole of Mosque Square are being put under grass and trees ; this will solve the dust nuisance around the food markets and provide a pleasing and healthy open space for the native area of the town.

Water for gardens has already been carried as far south as the Railway line and it is hoped that sufficient water will be available next year to increase the numbers of trees in the roads.

The vegetable market in Khartoum has been entirely remade with a new type of stall with a storeroom underneath, and water for washing fruit and vegetables is now being laid on to a number of sinks.

The abbattoir has been doubled in size and now has a high wall around it and electric light is laid on.

It is perhaps too early to attribute any improvement in general health conditions to the work done by the additional staff since their approval about the middle of the year, but three points seem to call for special comment :—

(1) The vast improvement in the conditions of cleanliness in European compounds, including kitchens and servants' quarters and latrines.

(2) The reduction of bacillary dysentery in Khartoum by 30 per cent. since the introduction of disinfectant into all buckets.

(3) The fall in the incidence of primary malaria in Khartoum from 155 cases in 1928 to 86 cases in 1929 in spite of unusually heavy rains.

CONSERVANCY SYSTEM AND REFUSE COLLECTION.

Both these services have continued to work smoothly throughout the year in the three towns.

In Omdurman, experiments have been made during the year with a view to improving pit latrines which are considered to be a source of fly breeding. In one main street adjoining the Civil Hospital all pit latrines have now been covered with a cement slab and housed in a mud building with a door and a wire window. In most instances, the owners of the properties have been persuaded to do the work themselves, but in a few instances financial assistance has been granted. The results have been extremely satisfactory, the latrines themselves are extremely clean and odourless and it is rare to find a fly in any of those so dealt with. As this type of pit latrine is developed, flies and fly borne diseases should begin to show a considerable diminution in Omdurman.

Since the additional motor and mule drawn vehicles have been put into use and a large number of new refuse bins have been distributed over the three towns, street cleaning and refuse removal show a great improvement.

FOOD SUPPLIES.

As already stated, funds were provided during the year for doubling the size of the abbattoir, erecting a high wall around it and installing electric light. At the time of writing, the wall and the electric light are complete but the concrete flooring is not yet available.

The importation and sale of pigs for slaughtering appears to be a growing business and the present arrangements for this business leave much to be desired. The question of better control of importation, inspection and slaughtering of pigs will be dealt with during the ensuing year.

MARKETS.

The vegetable market in Khartoum is now in excellent condition and consumers can now rely on a good display of clean fruit and vegetables.

The new live-stock market, though not yet complete, will provide all-metal cages for chicken and pigeons, which can always be kept thoroughly clean.

The meat and fish markets remain the same.

One new butchers shop outside the market area was opened during the year by a Greek. The premises are kept in very good order and the quality of the meat sold is excellent.

The growing demand for more and better fruit has been productive of two new private shops in Khartoum for the sale of imported fruit; it is hoped that the business will be encouraged for the good of the community.

There can be no doubt that the cold storage business opened during the year has been extremely popular, in enabling those who can afford it to buy European fish, meat, cheese, etc.; the premises are frequently inspected to ensure thorough cleanliness and sound food.

The markets in Omdurman remain the same, special attention has been given throughout the year to reduce the fly nuisance in these markets.

In Khartoum North, one additional meat market has been erected during the year.

Improvements to the Belgravia Dairy have already been commented on, but the complete scheme was not finished by the end of the year.

LEGISLATION.

Regulations were published under the Public Order Ordinance, 1921, insisting on the use of a standard measure of one rotl and a standard measure of half a rotl by persons selling milk in the Municipal Areas of the three towns.

EXPENDITURE.

The total expenditure on sanitary services for the year 1929 was £E. 27,295.

POPULATION.

The population of the province is estimated at 247,431 made up as follows :—

	Men	Women	Children	Total
Khartoum..	12,449	12,139	17,352	41,940
Khartoum North..	6,126	7,223	7,718	21,067
Omdurman..	29,359	39,844	33,780	102,983
Rural District	24,213	30,961	26,267	81,441
Total	72,147	90,167	85,117	247,431

Of the above, the following are non-natives of the Sudan :—

	Khartoum	Khartoum North	Omdurman	Rural District	Total
Egyptians and Syrians					
Men	684	300	182	1	1,167
Women	637	165	152	—	954
Children	1,080	285	252	—	1,617
Europeans and Americans ..					
Men	1146	31	39	5	1,221
Women	692	15	26	3	736
Children	2136	10	5	2	2,153
Other non-Natives ..					
Men	306		294		600
Women	142		106		248
Children	247		128		375
Total	7,070	806	1,184	11	9,071

The total estimated population shews an increase of 6,398 over last year. In addition to the above figures, there were an average of 1,464 British troops and 1,274 native troops stationed in the area throughout the year, bringing the population up to 250,169.

BIRTHS AND DEATHS.

4,235 births and 2,543 deaths were registered during the year, showing an excess of births over deaths of 1,692.

The following table shows the relationship of birth and death rates to the population of each locality per 1,000.

	Population	Births	Birth Rate	Deaths	Death Rate
Khartoum	41,940	755	18.0	477	11.3
Khartoum North ..	21,067	505	23.9	269	12.7
Omdurman ..	102,983	1,556	15.1	1,005	9.7
Rural District ..	81,441	1,419	17.4	792	9.7
Total ..	247,431	4,235	17.1	2,543	10.2

159 still births were also registered in the four localities during the year.

The total number of births registered shews an increase of 569 or 2 per thousand and the deaths registered were fewer by 103 or ·5 per thousand over 1928, which may be considered positive proof of the general improvement in health conditions throughout the year.

With regard to each of the four localities, the birth rate shows an increase except in the case of Khartoum North where a small decrease of ·9 per thousand is returned, and the death rate is lower in each instance with the exception of Khartoum where the increase is at the rate of .6 per thousand over the preceding year.

The infantie mortality for the four localities was 66.3 per 1,000 births and in each locality was as follows : —

	per 1,000 births.
Khartoum	71.5
Khartoum North	65.3
Omdurman	79.1
Rural District	50.0

The infantile mortality for the natives of the Sudan in the four localities was 66.4 per 1,000 births in contrast to 79.8 in 1928.

It is very satisfactory to be able to report a further marked reduction in the infantile mortality rate. In 1927 for natives of the Sudan the figure was 86.1, in 1928 it was 79.8 and for the year now reported it was fallen to 66.4 per thousand, *i.e.* a drop of 19.7 per-thousand in three years. This may be very largely attributable to the improved midwifery methods during recent years.

BIRTHS RECORDED BY MONTHS, LOCALITIES AND SEXES.

Month	Khartoum		Khartoum North		Omdurman		Rural District		TOTAL		Still Births	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
January	35	28	22	21	54	60	42	37	153	146	6	1
February	27	25	12	25	58	51	70	66	167	167	4	11
March	28	30	17	27	74	59	44	49	163	165	7	5
April	31	20	23	23	65	56	77	57	196	156	8	7
May	34	31	25	21	61	62	51	54	171	168	3	2
June	27	27	9	27	58	62	40	46	134	162	11	2
July	26	27	17	17	87	85	75	72	205	201	14	13
August	55	36	12	19	85	58	51	53	203	166	2	9
September	36	40	23	28	65	72	86	101	210	241	8	6
October	37	40	17	31	73	58	65	61	192	190	6	7
November	25	28	28	24	71	64	81	70	205	186	6	8
December	34	28	13	24	67	51	26	45	140	148	7	6
Total	395	360	218	287	818	738	708	711	2139	2096	82	77
	755		505		1,556		1,419		4,235		159	

	Births		Total	Still Births	
	M.	F.		M.	F.
Khartoum	395	360	755	16	13
Khartoum North	218	287	505	12	10
Omdurman	818	738	1,556	21	14
Rural District	708	711	1,419	33	40
Total ...	2,139	2,096	4,235	82	77

BIRTHS RECORDED BY NATIONALITIES, LOCALITIES AND SEXES

Nationality	Khartoum		Khartoum North		Omdurman		Rural District		Total		Still Births	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
British	5	4	—	—	—	—	—	—	5	4	—	—
Greek	12	13	—	—	1	—	—	—	13	13	1	—
Other Europeans	6	5	—	—			—	—	6	5	1	—
Egyptians & Syrians	79	63	28	24	21	18	—	—	128	105	2	3
Natives of the Sudan	280	266	190	262	790	719	708	711	1,968	1,958	78	74
All Others... ...	13	9	—	1	6	1	—	—	19	11	—	—
Total ...	395	360	218	287	818	738	708	711	2,139	2,096	82	77
	755		505		1,556		1,419		4,235		159	

DEATHS RECORDED BY MONTHS, LOCALITIES AND SEXES.

Month	Khartoum		Khartoum North		Omdurman		Rural District		Total	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
January	15	14	14	12	40	47	37	25	106	98
February	15	7	8	15	23	44	35	24	81	90
March	28	12	7	6	27	38	33	40	95	96
April	20	15	6	13	26	50	34	35	86	113
May	19	12	9	14	32	49	24	28	84	103
June	14	9	8	9	30	55	29	28	81	101
July	23	17	7	9	42	64	34	46	106	136
August	31	36	17	18	57	53	22	28	127	135
September	22	28	15	16	43	55	48	57	128	156
October	22	24	6	15	36	41	31	45	95	125
November	30	14	9	17	31	41	29	35	99	107
December	30	20	6	13	30	51	20	25	86	109
Total ...	269	208	112	157	417	588	376	416	1,174	1,369
	477		269		1,005		792		2,543	

DEATHS RECORDED BY NATIONALITIES, AGE PERIODS AND SEXES.

Khartoum, Khartoum North, Omdurman, and Rural District.

NATIONALITY.	Under 1 Year	1 to 5	5 to 10	10 to 20	20 to 40	40 to 60	over 60	Total	
								M.	F.
British … … … … … …	—	—	1	—	2	1	—	4	—
Greek … … … … … …	4	5	—	1	4	2	1	12	5
Other Europeans … … … …	—	2	1	—	—	—	—	2	1
Egyptians and Syrians … … … …	15	13	1	2	6	13	6	32	24
Natives of the Sudan … … … …	261	484	116	102	334	280	864	1,114	1,327
All others … … … … …	1	1	—	1	6	2	11	10	12
Total … … …	281	505	119	106	352	298	882	1,174	1,369
								2,543	

DEATHS RECORDED BY NATIONALITIES, LOCALITIES AND MONTHS IN CHILDREN UNDER FIVE YEARS.

Month	Khartoum										Khartoum North				Omdurman						Rural District		Total
	Greek		Other Europeans		Egyptians and Syrians		Natives of the Sudan		All Others		Egyptians and Syrians		Natives of the Sudan		Egyptians and Syrians		Natives of the Sudan		All Other		Natives of the Sudan		
	0-1	1-5	0-1	1-5	0-1	1-5	0-1	1-5	0-1	1-5	0-1	1-5	0-1	1-5	0-1	1-5	0-1	1-5	0-1	1-5	0-1	1-5	
January	—			1	—		2	2	—		—			7	—		8	18	—		5	14	57
February ...	—		—		2		4		—		—		4	7	1	1	5	14	—		8	8	54
March	—		—		—		4	6	—		—		1	4	1		11	10	—		8	16	61
April	—		—		—		3	6	—		—		2	5	—		14	17	—		8	20	75
May		1	—		—		3	5	—		—		2	5		1	13	15	—		6	11	62
June	—		—		—			3	—		—		2	4		1	14	10	—		8	10	52
July		1	—		1	1	1	10		1	—		3	5	—		17	22	—		5	15	82
August	1		—		1	3	7	8	—		—		5	5	1		14	24	1		4	13	87
September ...	2	3		1	1		7	7	—		1	1	4	10	1	2	6	17	—		7	30	100
October	1		—		1	1	7	4	—		2	1	1	8	—		5	20	—		5	10	66
November ...	—		—		—		2	6	—			1	3	6	—		5	15	—		4	10	52
December ...	—		—		2		2	2	—		—		3	5	—		6	8	—		3	7	38
Total ...	4	5	—	2	8	5	42	59	—	1	3	3	30	71	4	5	118	190	1	—	71	164	786

	Under one year	From one to five years	Total
Khartoum	54	72	126
Khartoum North ...	33	74	107
Omdurman	123	195	318
Rural District	71	164	235
Total...	281	505	786

COMMUNICABLE DISEASES.

Two great improvements must be recorded under the above heading, (1) the completion of the new infectious diseases hospital of 40 beds in Khartoum and (2) the provision of a motor ambulance for the sole transport of infectious cases. Both of these, which only came into use at the end of the year, will greatly facilitate the transport, isolation and care of persons suffering from these diseases in Khartoum.

The following tables show the total number of cases of communicable diseases notified by hospitals and medical practitioners in the three towns during the year; the figures for the Rural District are unreliable as they only represent cases notified by the dispensaries at Geili and Gebel Aulia.

The more important of these communicable diseases are dealt with separately under their respective headings.

TABLE I.

SHOWING NUMBER OF CASES NOTIFIED.

Disease	Khartoum Local Cases	Khartoum North Local Cases	Omdurman Local Cases	Total of Local Cases	Rural Dist. Cases	Imported Cases	Relapsed Cases	Grand Total
Chicken Pox	50	20	7	77	5	2	—	84
Diphtheria	33	10	69	112	1	2	—	115
Meningitis, Acute ...	1	1	—	2	—	2	—	4
Meningitis, Cerebro-spinal	1	—	1	2	—	—	—	2
Ankylostoma ...	—	—	—	—	—	1	—	1
Bilharzia	4	17	27	48	1	17	—	66
Amoebic, Dysentery...	59	15	83	157	3	17	31	208
Bacillary, Dysentery	26	10	20	56	—	8	6	70
Typhoid Fever ...	8	10	29	47	2	7	—	56
Kala Azar	—	—	—	—	—	10	—	10
Leprosy	—	—	3	3	—	3	—	6
Malaria	86	9	11	106	1,021	78	1,122	2,327
Black Water Fever ...	3	—	—	3	—	1	1	5
Malta Fever	—	—	—	—	—	4	—	4
Measles	27	12	13	52	—	6	—	58
Pulm. Tuberculosis ...	21	8	10	39	4	32	—	75
Puerperal Fever ...	3	—	—	3	—	—	—	3

In addition to the above, 363 clinical cases of malaria were notified during the year.

It should be noted that the notifications for all the more important communicable diseases show a reduction with the exception of those for pulmonary tuberculosis.

COMMUNICABLE DISEASES.

TABLE II.

Key :— K: Khartoum, K.N.: Khartoum North, O.: Omdurman, R.D.: Rural District, I.: Imported, R.: Relapsed.

Disease	Place	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	Grand Total
Chicken Pox	K.	—	4	13	14	7	2	5	4	—	—	1	—	50	
	K.N	—	2	7	6	3	1	—	—	—	—	1	—	20	
	O.	—	—	2	5	—	—	—	—	—	—	—	—	7	
	R.D.	3	—	—	—	1	—	1	—	—	—	—	—	5	
	I.	—	—	—	1	—	—	—	—	—	—	1	—	2	84
Diphtheria	K.	6	5	3	—	—	—	3	6	4	3	3	—	33	
	K.N.	1	1	2	—	—	—	—	3	2	1	—	—	10	
	O.	15	2	6	4	7	4	2	24	5	—	—	—	69	
	R.D.	—	—	1	—	—	—	—	—	—	—	—	—	1	
	I.	—	—	—	—	1	—	—	—	—	—	1	—	2	115
Meningitis, Acute	K.	—	—	1	—	—	—	—	—	—	—	—	—	1	
	K.N.	—	—	—	1	—	—	—	—	—	—	—	—	1	
	I.	—	—	1	—	—	—	—	1	—	—	—	—	2	4
Meningitis, Cerebro-spinal	K.	—	—	—	—	—	—	—	1	—	—	—	—	1	
	O.	—	—	—	—	1	—	—	—	—	—	—	—	1	2
Ankylostoma	I.	—	—	—	—	—	—	—	—	—	1	—	—	1	1
Bilharzia...	K.	—	2	—	1	—	—	1	—	—	—	—	—	4	
	K.N.	—	—	1	—	—	—	—	5	1	1	8	1	17	
	O.	2	3	2	1	2	—	1	2	—	6	5	3	27	
	R.D.	—	—	—	—	—	—	—	1	—	—	—	—	1	
	I.	—	—	1	—	—	6	—	4	2	2	1	1	17	66

(Contd.)

COMMUNICABLE DISEASES.

TABLE II —(*Continued*).

Disease	Place	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Cct.	Nov.	Dec.	Total	Grand Total
Amoebic Dysentery	K.	6	—	1	4	5	6	7	7	11	7	5	—	59	
	K.N.	3	3	1	1	—	—	—	1	4	—	2	—	15	
	O.	10	7	7	9	6	11	10	6	4	5	4	4	83	
	R.D.	—	—	—	—	—	—	1	1	—	1	—	—	3	
	I.	—	3	3	1	1	—	4	2	—	—	2	1	17	
	R.	1	2	—	1	—	6	4	3	6	5	2	1	31	208
Bacillary Dysentery	K.	3	2	2	—	—	—	5	5	8	1	—	—	26	
	K.N.	—	—	—	—	—	—	—	3	2	2	2	1	10	
	O.	—	2	—	—	—	—	6	—	3	2	5	2	20	
	I.	2	—	1	—	1	1	1	—	—	—	1	1	8	
	R.	—	—	1	1	—	—	—	—	1	—	—	3	6	70
Typhoid Fever..	K.	1	1	2	2	—	—	—	—	2	—	—	—	8	
	K.N.	4	1	—	1	1	—	—	1	—	2	—	—	10	
	O.	3	2	1	1	3	6	4	2	4	2	1	—	29	
	R.D.	—	—	—	—	—	1	1	—	—	—	—	—	2	
	I.	2	—	—	—	—	1	—	—	2	1	—	1	7	56
Kala Azar	I.	—	—	1	—	1	1	2	—	2	—	3	—	10	10
Leprosy	O.	—	—	—	—	—	—	—	1	1	—	—	1	3	
	I.	—	—	—	1	—	1	1	—	—	—	—	—	3	6

(*Contd.*)

COMMUNICABLE DISEASES.

TABLE II—(*Continued*).

Disease.	Place	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	Grand Total
Malaria	K.	5	5	1	—	—	—	1	1	10	24	15	24	86	
	K.N.	1	1	1	—	—	—	—	—	—	2	1	3	9	
	O.	2	—	—	—	—	—	—	—	5	4	—	—	11	
	R.D.	68	2	93	50	20	40	50	43	95	217	184	159	1021	
	I.	7	1	3	3	3	2	2	2	14	15	15	11	78	
	R.	45	41	42	36	32	40	45	94	190	226	206	125	1122	2327
Blackwater Fever	K.	—	—	2	—	—	—	—	—	—	—	—	1	3	
	I.	—	—	—	—	1	—	—	—	—	—	—	—	1	
	R.	—	—	—	—	—	—	—	—	—	—	1	—	1	5
Malta Fever	I.	2	—	1	—	—	—	—	—	—	—	—	1	4	4
Measles	K.	2	—	5	4	2	1	3	4	3	3	—	—	27	
	K.N.	5	2	—	—	—	1	—	4	—	—	—	—	12	
	O.	—	—	3	7	—	—	3	—	—	—	—	—	13	
	I.	—	—	1	—	2	1	—	2	—	—	—	—	6	58
Pulmonary Tuberculosis	K.	2	—	2	2	2	2	1	5	2	—	3	—	21	
	K.N.	1	—	—	1	1	1	—	2	1	—	1	—	8	
	O.	—	1	1	—	—	5	1	1	—	—	—	1	10	
	R.D.	—	1	—	1	—	—	—	—	—	—	2	—	4	
	I.	3	3	1	4	—	4	3	4	2	—	3	5	32	75
Puerperal Fever	K.	—	—	—	1	—	—	—	—	1	—	1	—	3	3

In addition to the above, 363 clinical cases of malaria were notified during the last four months of the year.

Malaria.

The rainfall during the year was 253.9 millimetres which is the highest recorded since 1923.

In the last report, attention was drawn to the apparent five yearly cycle of higher rainfall and higher malarial incidence in this Province, as evidenced by the figures for 1917-1918 and 1922-1923, forecasting unfavourable conditions for 1929.

These unfavourable conditions definitely arose during the months of July and August. For two months large tracts of country to the south and east of Khartoum were inundated and the town was threatened with a very serious influx of anophelines with a consequent high malaria rate.

In addition to our local difficulties, very heavy rains were reported all along the railway line to the south, which meant that trains would be importing adult mosquitoes into Khartoum for some time to come.

It become evident that the whole staff would be needed to concentrate on anti-malarial measures.

The Burri drain which had not been opened for six years was entirely redug by prison labour and drained off an enormous volume of water from the race-course area and the country east of the Medani line.

A very large area of water south of the Deims found its way to the White Nile, but it became necessary to ask for additional help to deal with this locality. The Kaid El 'Amm kindly provided the assistance by lending the whole of the 9th Sudanese Battalion for several days; the work done by these troops was of inestimable value. Grass and millet were particularly troublesome in this area and necessitated the use of large quantities of Paris Green whenever infections were found.

Quinine was issued free to Sheikhs for free distribution at the Deims and several neighbouring villages; it also was issued free at the two quarantine stations for boats on the river. I believe that this free issue of quinine had the effect of cutting short and aborting a large number of early cases of malaria.

Every train arriving from the south was inspected for adult mosquitoes and whenever any were found they were destroyed with flit mixture.

As will be seen from the mosquito statements at the end of this report, the culex infections very largely predominated the anopheline during the rain months, but the total infections found of both varieties of mosquito greatly exceeded those found during the same period for the last four years, which is a clear indication of the danger which threatened the population.

All the town drains worked well, but the drain to the south of the town from the Deim to the Sunt Forest gave rise to a great deal of trouble by silting and falling in.

In spite of excellent rains and the large number of infections found, the incidence of primary cases of malaria in Khartoum between September and December was kept remarkably low, only 79 such cases being reported or 0.19% of the population.

Further, it should be noted that in 1928 during the first three months of the year 109 new cases of malaria were notified in Khartoum, in the year now under consideration only 11 such cases occurred during the same period and at the time of writing this report, February, 1930, only three cases have been notified.

It was entirely due to the untiring efforts of the staff both British and native that it was possible to keep the incidence of primary malaria well within bounds during an exceedingly difficult period, and it is hoped that with the additional staff now provided this satisfactory state of affairs will be maintained. During the present winter, the Sanitary Inspector, Rural District, with his staff and lorry have done most excellent anti-mosquito work on the river pools ; no pupal infections have occurred over very large stretches of river, resulting in the almost complete freedom of Khartoum from adult mosquitoes.

The following tables show the incidence of primary malaria by sexes, nationalities and age periods and also cases amongst British troops and types of parasites :—

Sexes :—

Males	161
Females	23

Nationalities :—

British	76
Other Europeans	8
Natives of the Sudan	100

Age Periods :—

1–5	5–10	10–20	20–40	40–60	over 60	Undefined.
14	9	24	123	5	1	8

British Troops Cases :—

Khartoum	53
Khartoum North	5
Imported	7

Type of Parasites :—

	Civil.	Troops.
Malignant Tertian	90	19
Benign Tertian	23	43
Quartan	3	2
B.T. and M.T.	—	1
Not defined	3	—

No primary cases of malaria occurred amongst Sudan Defence Force troops or in Central Prison.

Deaths. 7 death soccurred amongst all cases of malaria notified during the year and 6 more deaths were presumed as caused from malaria.

ANTI-MOSQUITO WORK.

The total cost of this work within the province was £E. 2,932 *i.e.*, labour £E2,250, larvicide £E. 682, an increase of £E. 848 on the previous year.

The total number of infections found was 9,399 of which 3,894 were found in Khartoum district, 828 in Khartoum North, 1,276 in Omdurman and 3,401 in the Rural District. It should be noted that in Khartoum district the total number of infections found was 1,863 less than the previous year in spite of the heavy rains. Of all the infections found only 64 were in the pupal stage, which again shows a decrease of 147 compared to 1928.

The reduction in the number of local infections and especially of those found in the pupal stage, is evidence of the value of the additional staff which has enabled us not only to cover a larger area but to reduce the intervals between inspections of any one area.

DIPHTHERIA.

The epidemic of diphtheria which began in Khartoum in the autumn of 1927, had been controlled there by the beginning of 1928, but reappeared in epidemic form in Omdurman throughout that year.

During these two years every effort was made to collect all possible contacts and to encourage the people to notify cases of sore throat early.

Pamphlets on the danger of the disease were widely distributed.

During the year now under review, the total notifications though still high show a reduction of 20 per cent. on the preceding year. Though the notifications for Khartoum have risen 74 per cent. those for Omdurman have fallen 44 per cent.

Up to the time of writing, there has been no notification of this disease in Omdurman for five months or in Khartoum or Khartoum North for nearly three months, which would appear to be definite evidence that the epidemic of the past two years is on the wane.

Since the cycle of epidemicity of this disease is probably a very long one, a further fall in the curve of incidence may be anticipated in the Sudan for some years but it is unlikely that we shall enjoy the comparative freedom from this disease which existed before 1926.

Below is a table showing the incidence of diphtheria in this province during the last ten years :—

	Khartoum	Khartoum North.	Omdurman	Imported	Total
1929	33	10	69	3	115
1928	19	19	104	3	145
1927	61	6	36	4	107
1926	16	5	3	1	25
1925	6	1	5	—	12
1924	13	5	—	—	18
1923	5	1	—	1	7
1922	2	—	1	—	3
1921	7	—	—	—	7
1920	5	1	—	1	7

During the year 175 school children were given preventive inoculations against diphtheria in Khartoum North without any ill effects. No cases of diphtheria have occurred amongst those so protected.

The prohibitive cost of these inoculations at present prevents any protective campaign on a large scale, but enquiries are now being made with a view to obtaining cheaper material. The disease undoubtedly enters this country by means of carriers from Egypt, there is also a nidus of infection in Halfa province.

The following tables show the incidence of diphtheria by sexes, nationalities and the mortality since the commencement of the epidemic in 1927.

	1927	1928	1929
Sexes :—			
Males	60	86	63
Females	47	59	52
Mortality :—	23 % 21.5	32 % 22	21 % 18.2
Nationalities :—			
British	6	3	3
Other Europeans	11	4	6
Egyptians and Syrians	16	14	12
Natives	74	124	94

Age periods :—

0–1	1–5	5–10	10–20	20–30	30–40	over 40	Undefined
7	42	31	16	10	4	3	2

Cases among British Troops	2
,, ,, S.D.F. Troops	Nil
Central Prison cases	Nil

Of the total cases notified 35, or 30 per cent., were positive contacts and were not suffering from the disease in its acute stages ; last year 45 per cent. of the cases were positive contacts.

PULMONARY TUBERCULOSIS.

The total notifications for this disease show an increase of 13.6 per cent. Whilst the locally contracted cases in Khartoum have doubled this year, those in Khartoum North remain the same and those in Omdurman have decreased by a half and the number of imported cases has risen 50 per cent.

The case incidence in the three towns was :—

	per 1,000
Khartoum	.5
Khartoum North	.4
Omdurman	.01

The following table shows the result of investigation at the end of the year of all notified cases :—

	Khartoum	Khartoum North.	Omdurman	Rural District	Total
Died	11	6	8	1	26
Left District	19	—	6	1	26
Still in Hospital ..	3	—	1	—	4
Still in District.. ..	3	4	5	—	12
Untraced	5	—	—	2	7

Sexes :—

Males	61
Females	14

Nationalities :—

Europeans	2
Natives	68
All others	5

Age periods :—

1–10	10–20	20–30	30–40	40–50
1	7	35	20	12

British Troops cases	Nil
S.D.F. Troops cases	4 with one death
Central Prison	1

Of the 32 cases of pulmonary tuberculosis which were contracted outside the province, 29 were contracted in the following localities :—

Uganda	1
Somaliland	1
Berber Province	4
Dongola Province	3
Kassala Province	2
Blue Nile Province	9
Fung Province	3
White Nile Province	3
Kordofan Province	2
Bahr el Ghazal Province	1

TYPHOID FEVER.

It is very satisfactory to be able to report a reduced incidence of this disease in each of the three towns.

With the exception of troops and direct contacts of positive cases, who are inoculated, the native population is entirely unprotected artificially ; it would appear, however, from the incidence by age periods that adults over 20 years of age acquire a large degree of natural immunity.

Since the source of infection in this disease as in the case of the dysenteries is most probably by means of flies through carrier cases, the best hope of combating it lies in rendering bucket and pit latrines as objectionable to flies as possible.

In Khartoum this is now done by placing a quantity of crude coal tar disinfectant in every bucket and a strong spring on the door of all native latrines in Government houses, while fly prevention is tackled as energetically as possible.

In Khartoum North no disinfectant is as yet placed in buckets except in the case of British barracks.

In Omdurman where there are only a few buckets and thousands of pit latrines, mostly exposed in private compounds, we are endeavouring to get the pits covered by a cement slab and housed in mud rooms. Fly prevention in a large native city like Omdurman presents a most difficult problem, but if we can prevent the flies from gaining access to human excrement there is some hope of reduction in diseases of the enteric type.

Judging from the notifications during the past ten years (see list below) it would appear that typhoid fever has been going through a phase of increased activity during the last four years, especially in Omdurman, but at the same time it must be remembered that hospital facilities have greatly increased during this period and the population have acquired greater confidence in medical work.

1929	1928	1927	1926	1925	1924	1923	1922	1921	1920
56	73	67	57	11	13	19	11	9	5

Of the 56 cases notified during the year, 12 carriers were discovered by examination of contacts of active cases, 2 in Khartoum and 10 in Omdurman, in the previous year 7 carriers were discovered and treated.

Sexes :—

Males	34
Females	22

Nationalities :—

British	1
Other Europeans	1
Egyptians and Syrians	15
Natives	38

Age periods :—

1–5	5–10	10–20	20–30	30–40	over 40	Undefined
8	10	19	13	3	2	1

Types of Typhoid :—

Para. A.	Para. B.	Para. A and B.	Typhosus.
8	5	4	39

Deaths :—

Males	2
Females	2

British Troops 1, S.D.F. Troops 3, with 1 death. Central Prison 3.

DYSENTERIES.

The total notifications of both types of dysentery show a reduction on those for the three preceding years; in the case of bacillary dysentery there is an 18 per cent. decrease and in the case of amoebic dysentery a 15 per cent. decrease.

With regard to bacillary dysentery among the European population, there is a gratifying reduction of 54.6 per cent, only 20 cases being notified or a case incidence of 0.3 per cent. This improvement may be attributed to the disinfectant which is now placed in every bucket in Khartoum, thus reducing the possible source of infection from more than 3,500 buckets. Another possible cause is the improvement effected by employing a British sanitary inspector solely on Britishers' houses to maintain a higher standard of cleanliness in kitchens, waste water drains, stables and servants latrines.

Only five cases of amoebic dysentery occurred among the British population.

	1926	1927	1928	1929
Bacillary	88	84	83	70
Amoebic	279	221	243	208
BRITISH CASES.				
Bacillary	31	29	33	15
Amoebic	13	10	4	5

The milder Flexner type continues to predominate.

The following tables show the incidence of each variety by nationalities, sexes, age periods and the types of organism isolated in cases of bacillary dysentery :—

Amoebic Dysentery.

Sexes :—

Males	173
Females	30
Undefined	5

Nationalities :—

British	5
Egyptians and Syrians	6
Natives	192
Undefined	5

Age periods :—

1–10	10–20	20–30	30–40	40–50	50–60	Over 60	Undefined
19	44	88	24	11	7	5	10

British Troops cases	Nil
S.D.F. Troops cases	3
Central Prison cases	3

Bacillary Dysentery.

Sexes :—

Males	51
Females	16
Undefined	3

Nationalities :—

British	15
Other Europeans	5
Egyptians and Syrians	2
Natives	42
All others	3
Undefined	3

Age periods :—

1–10	10–20	20–30	30–40	40–50	50–60	Over 60	Undefined
14	10	25	9	4	—	2	6

		Per cent.
British Troops cases	7	.42
S.D.F. Troops ,,	7	.47
Central Prison ,,	10	—

	Civil.	British Troops.	S.D.F. Troops.	Central Prison.	Total.
Types of organism :—					
Flexner	29	7	6	8	50
Shiga	14	—	1	2	17
Undefined	3	—	—	—	3

Deaths:- 10 deaths occurred amongst all cases of dysentery notified and 6 more deaths were presumed as caused from dysentery.

FLY PREVENTION.

During the year 3,971 permits were issued for making zibla in the three towns *i.e.*, 1,724 in Khartoum 1,283 in Khartoum North and 964 in Omdurman. This figure shows a decrease of 240 compared with 1928. Flies were very prevalent as usual during the months of August and September, during which period zibla is always extensively used for repair work to mud built houses. I must repeat that until the use of this noxious mixture is prohibited by regulation there cannot be any real improvement in the fly nuisance.

Waste Water Disposal:- In my last report I drew attention to the problem of waste water disposal in Khartoum, and I regret to say I cannot report any improvement in this respect. Numerous complaints have again been received regarding offensive smells in the centre of the town where a large number of restaurants is situated at which there are no other means of waste water disposal than by throwing the water out on the street. Conditions are likely to remain as they are or even worse until such time as a water carriage system of sewage disposal is adopted.

SMALL POX AND VACCINATION.

No case of small pox occurred in the province during the period under review.

The following table shows the number of vaccinations done in the province during the year :—

	Successful	Failed	Unknown	Total
Khartoum Civil Hospital	1,040	193	126	1,359
British Military Hospital	146	99	—	245
S.D.F. Hospital	167	65	—	232
Khartoum North Dispensary	730	64	624	1,418
Omdurman Civil Hospital	1,378	113	30	1,521
C.M.S. Hospital, Omdurman	4	—	—	4
Geili Dispensary	307	31	54	392
Gebel Aulia Dispensary	136	30	46	212
Rural District	—	—	2,655	2,655
TOTAL	3,908	595	3,535	8,038

RABIES.

Two cases of rabies in dogs occurred in Omdurman during the year. As far as records are obtainable these were the first positive cases of this disease to be identified in the three towns.

Rabies has been prevalent in recent years in Kordofan and the White Nile Province which are on the direct trade route from the West with Omdurman; owing to the good rains this year water and grazing were plentiful and it is most probable that the infections spread along these trade roads through infected dogs or jackals.

The first case occurred in the dog of a British N.C.O. in August and the second in a stray dog in December. In both instances very stringent measures were taken to prevent further spread to Khartoum. Repeated campaigns against ownerless and stray dogs in the three towns led to the destruction, by shooting, of 1,057 animals.

MINERAL WATER FACTORIES.

The number of mineral water factories in the three towns is 6, *i.e.*, in Khartoum 4 (including one at British Barracks), Omdurman 2 and Khartoum North nil. All the premises have been regularly inspected and maintained in a good sanitary condition, and only a few minor complaints were received during the year.

BAKERIES.

The total number of European bakeries in the three towns is 38, *i.e.*, Khartoum 22, Khartoum North 5 and Omdurman 11. There is an increase of 1 and 5 in Khartoum North and Omdurman respectively.

The native bakery figures are 58, 10—5—and 43 respectively. All were inspected periodically and were maintained in a fairly good sanitary condition.

A number of complaints were received during the year regarding the dirty condition of bread supplied by several European bakeries in Khartoum, and not without cause. Action was taken in every case and the proprietors of the bakeries in question were either reported for prosecution or warned.

RESTAURANTS, NATIVE EATING HOUSES AND COFFEE SHOPS.

The total number of restaurants, native eating houses and coffee shops in Khartoum is 105, *i.e.*, restaurants (European) 12, coffee shops (European) 17, eating houses (native) 25 and coffee shops (native) 51.

All these premises have been regularly inspected throughout the year and on the whole have been maintained in a fairly good sanitary condition.

UNSOUND FOOD.

The following is a note of unsound food destroyed during the year:—

Khartoum :—	lb.
Fruit and Vegetables (tinned)	3644
Meat tinned	634½
Butcher meat	681
Fish (tinned)	506½
Cheese (tinned)	100
Milk (tinned)	926
Sauces	214½
Jams	137
Miscellaneous	17
TOTAL	6860½

Liquids :—

Lime-Juice, Champagne, Vermouth 1025 pint bottles.

Omdurman :—	lbs.
Butcher meat	158
Simsim oil	41
Total	199
GRAND TOTAL	7059½

MILK SUPPLY.

There are 365 milk vendors in the three towns *i.e.*, Khartoum 189, Khartoum North 60 and Omdurman 116. These figures show a decrease of 2 in Khartoum and an increase of 8 and 6 at Khartoum North and Omdurman respectively compared with 1928.

The following milk samples were taken during the year :—

Khartoum	162
Khartoum North	60
Omdurman	70
Total	292

which is an increase of 35 compared with 1928.

Of the samples taken in Khartoum 21 or 12.96% were below standard, and the average presumed extent of adulteration was 7.38% added water.

The Khartoum North figures are 15 or 25% and 5.65% respectively, while those of Omdurman are 13 or 18.5% and 5.2 %.

The undernoted is a comparison of percentages of adulterated samples in the three towns compared with 1928 :—

	1928	1929	
Khartoum	33.10%	12.96%	Decrease of 20.14%
Khartoum North	35.71%	25%	,, ,, 10.71%
Omdurman	18. 5%	18.56%	No difference.

It is interesting to note a considerable decrease in percentages of adulterated samples in Khartoum and Khartoum North and also in the presumed extent of adulteration in the former town. While the percentage of adulterated samples in Omdurman remains the same as in 1928, the extent of presumed adulteration dropped from 9.3% in 1928 to 5.2% in 1929.

Proceedings were instituted in 41 cases of adulteration as follows :—

Khartoum	16
Khartoum North	15
Omdurman	10

Warnings were issued in the remaining 8 cases which were slightly below standard. The amount of fines in Khartoum for adulteration was £E. 6.050m/ms, in Omdurman £E. 2.800m/ms and Khartoum North £E. 7.000m/ms.

Four vendors were prosecuted in Khartoum for selling milk without licences and one in Khartoum North for selling sour milk, and fines amounting to £E. 1.050 m/ms were inflicted.

During the year new standard milk measures of ½ rotl and 1 rotl capacity were introduced to the three towns. They are a distinct improvement on the old type.

NUISANCES.

The nuisances dealt with during the year were as follows :—

Khartoum	3318
Khartoum North	1145
Omdurman	2942

In addition many verbal notices were issued including 4043 in Omdurman.

PROSECUTIONS.

798 prosecutions were undertaken in the three towns during the year i.e. Khartoum 358, Khartoum North 244 and Omdurman 196 and fines amounting to £E.183.900 m/ms were inflicted.

NOXIOUS TRADES.

I regret to say that the new noxious trades area in Khartoum has not yet been brought into use, and it is to be hoped that action will be taken in this matter in the very near future.

The new noxious trades area in Omdurman was in full working order by the end of the year and practically the whole of the plots allotted were occupied.

INSANITARY PREMISES.

38 insanitary premises were listed for closing against human habitation in Khartoum towards the end of the year and action is now being taken regarding them.

RAT CATCHING.

751 rats were trapped and destroyed in Khartoum during the year i.e.,676 (Rattus Norvegicus) and 75 (Arvicanthus Testicularis).

WORKSHOPS.

Owing to the expansion of the workshops a British mechanical foreman was appointed towards the end of the year. His appointment will, to a certain extent, release the Chief Sanitary Inspector and will enable him to give more attention to his other duties.

During the year new carpenters' workshops were erected, and in the near future it is anticipated that the mechanical section will be extended and garage accommodation for the motor transport provided. This is most essential as the place is becoming very congested.

Blacksmiths Workshops.

The amount of new work carried out or existing stock extensively renewed is as follows:—

Conservancy lorries—2 new and 52 repaired.
Four-wheeled refuse carts—11 new.
Two-wheeled ,, —2 new.
Axles for lorries—17 new and 17 repaired.
,, ,, 4 wheeled carts 14.
Public refuse bins (conical) 55 new.
Public refuse bins (square) 4 new.

The total number of general repairs executed was 5,870 while general repairs to buckets were 16,272. 157 new hub bushes were cast for wheels of conservancy lorries and refuse carts.

Apart from the above the following new stock was made for the provinces:—

2 Conservancy lorries.
2 Four-wheeled all metal refuse carts.
6 Two-wheeled ,, ,, ,,
1 ,, ,, water tank cart.
42 Public refuse bins (conical)
2 Portable incinerators.
3 ,, boilers.
2 Washing tanks.

Carpenters Workshops.

30 conservancy lorry shafts and 10 box cart shafts were made in the carpenters workshops during the year, and 920 general repairs were carried out.

Saddlers Workshops.

35 sets camel harness (including 22 sets for the provinces) and 29 sets of mule harness were made while 4,482 general repairs were carried out.

WATER SUPPLY.

The Company's water supply to Khartoum and Omdurman continues to be excellent in quality.

The most recent report by the Government Bacteriologist on the Omdurman supply gave the following result:—

Tap Water Civil Hospital

B.coli absent in 50 cc.

	37°C.	22°C.
Colony count. per ccm. water	14	1.

B. welchii negative in 40 cc.

The swimming bath which has now been in use in the Sudan Club for two years is filled with Company's water every 12 days. The following report by the Government Bacteriologist dated 7.5.29 is therefore of considerable interest to Khartoum bathers:—

Sudan Club Swimming Bath.

Examination of water 7/5/29

The bath was filled on the 26th. of April and emptied on the 7th May. During the intervening 12 days approximately 530 bathers used the bath.

Specimens of water were taken from the bath at 6.30 a.m. on 7/5/29.

Results of Test.

Comparative figures showing the results of an examination of Khartoum tap water on 7/5/29 are given for comparison.

	Swimming Bath water	Khartoum tap water
MICROSCOPIC APPEARANCE.	Clear, colourless Tasteless and odourless.	
CHEMICAL TEST FOR NITRITES.	None.	None.
BACTERIOLOGICAL TEST.		
Bacteria per No, 1 cc. of water (growing at 37°C. for 24 hours)	6	7
Bacteria per 1 cc. of water (growing at 22°C. for 24 hours)	None.	None.
Bacillus Coli in 50 ccs. of water	None.	None.
Bacilli of the welchii group in 50 ccs. of water	None.	None.
Streptococci in 50 ccs. of water	None.	None.
Staphylococci in 50 ccs. of water	Present.	None.

Conclusion.

The water in the swimming bath remains practically unchanged bacteriologically after 12 days.

The chances of disease arising as a result of using the Sudan Club swimming bath are infinitesimal.

CONCLUSION.

In conclusion, this report, which shows a considerable improvement in the health of Khartoum Province, would seem to justify the increased expenditure on sanitary services.

The work has been carried out by an enthusiastic staff backed by a helpful provincial administration.

The future will, no doubt, entail even further expenditure until such time as real efficiency can be arrived at with the installation of a system of water-borne sewage.

(Sgd.) J. C. N. HARRIS, M.D.

METEOROLOGICAL OBSERVATIONS AT GORDON COLLEGE, KHARTOUM FOR THE YEAR 1929.

Month	Temperature in Degrees Farenheit				Average Relative Humidity % at 8.00 a.m.	Rains in m/ms.	Haboobs
	Highest Maximum	Average Maximum	Lowest Minimum	Average Minimum			
January	95.2	87.5	55.0	61.0	29	Nil	—
February	108.5	93.2	54.8	63.8	17	,,	—
March	107.2	96.8	60.1	66.2	14	,,	—
April	113.0	104.9	64.2	75.6	14	,,	1
May . ..	113.0	107.2	67.8	80.6	36	6.1	12
June	110.6	106.4	71.8	79.7	37	8.9	5
July	102.3	92.3	67.8	74.2	71	165.3	1
August	103.5	96.6	66.6	75.6	66	70.1	1
September	106.8	100.6	70.5	77.7	55	3.5	1
October	106.7	102.0	71.8	77.0	31	Drops	—
November	103.0	94.9	55.9	69.6	34	Nil	—
December	99.8	83.7	47.0	56.8	33	,,	—
					Total ...	253.9	21

I am indebted to Mr. R. Cottam, the Meteorological Observer, for the above table which he kindly supplied.

PROVINCE GENERAL.
DISTRIBUTION OF STAFF.

Locality.	British Sanitary Inspector.	Native Overseers.	Mosquito Men.	Conservancy.	Refuse.	Workshops	Clerical.	Other Staff.
Headquarters & Khartoum . .	4	10	43	158	103	39x	6	38*
Khartoum North.	1	1	7	39	29	8	1	2
Omdurman.	2	6	6	22	81	2	1	35
Rural District.	1	—	8	1	1	—	—	1
Total	8	17	64	220	214	49	8	76

* Includes Light Railway squad.

x Includes British Mechanical Foreman.

KHARTOUM.

MOSQUITO STATEMENT FOR YEAR ENDING 31st DECEMBER, 1929.

	Infections inside municipal boundary.																		Infections outside municipal boundary.											
	No. of wells infected			No. of zeers pits and other small receptacles infected			No. of steamers and boats infected.			No. of pools infected			Total infections.			No. of permanent collections.	Percentage of permanent collections infected.	Last year's percentage.	Burri.			Blue Nile above Burri.			Omdurman and White Nile.			Total Infections		
	C.	S.	A.	C.	S.	A.	C.	S.	A.	C.	S.	A.	C.	S.	A.				C.	S.	A.	C.	S.	A.	C.	S.	A.	C.	S.	A.
January	—	—	—	14	—	2	—	—	—	14	—	90	28	—	92	237	—	.83	1	—	—	—	—	82	74	—	20	75	—	102
February	1	—	—	9	—	2	—	—	—	31	—	92	41	—	94	238	.42	1.25	—	—	—	9	—	27	64	—	15	73	—	42
March	2	—	—	20	—	1	2	—	—	33	—	79	57	—	80	240	.83	.83	—	—	—	3	—	38	70	—	21	73	—	59
April	1	—	—	21	—	4	5	—	—	30	—	54	57	—	58	228	.43	1.25	1	—	—	1	—	27	112	—	25	114	—	52
May	2	—	—	39	—	1	1	—	—	9	—	10	51	—	11	223	89	.83	1	—	—	10	—	3	96	—	4	107	—	7
June	5	—	—	37	—	—	1	—	—	20	—	3	63	—	3	224	2.23	—	3	—	—	1	—	—	84	—	4	88	—	4
July	13	—	—	193	—	2	12	—	1	197	—	10	415	—	13	224	5.80	1.6	15	—	—	—	—	—	89	—	4	105	—	4
August	13	—	1	161	—	10	2	—	—	376	—	257	552	—	268	224	5.80	2.1	8	—	—	30	—	19	136	—	81	174	—	100
September	8	—	—	119	—	34	—	—	1	170	—	400	297	—	435	223	3.58	2.5	10	—	2	23	—	65	61	—	170	94	—	237
October	5	—	—	104	—	15	—	—	—	115	—	163	224	—	178	223	2.24	1.6	3	—	—	12	—	6	96	—	47	111	—	53
November	2	—	—	39	—	4	2	—	—	42	—	95	85	—	99	221	.90	.42	2	—	1	10	—	37	69	—	19	81	—	57
December	1	—	2	11	—	6	1	—	—	14	—	41	27	—	49	221	1.35	.42	9	—	—	1	—	20	48	—	3	58	—	23
TOTAL	53	—	3	767	—	81	26	—	2	1051	—	1294	1897	—	1380	227	2.03	1.13	53	—	3	90	—	324	1000	—	413	1153	—	740

C. Culex. S. Stegomyia. A. Anopheline

MOSQUITO STATEMENT KHARTOUM NORTH FOR YEAR ENDING 31st DECEMBER. 1929.

MONTH 1929.	Infections inside municipal boundary.															No. of permanent collections.	Percentage of permanent collections infected.	Last year's percentage.	Infections outside municipal boundary,								
	No. of wells infected.			No. of pits zeers, and other small receptacles infected.			No. of steamers and boats infected.			No. of pools infected.			Total infections.						No. of river pools infected.			Farms in Shambat district.			Kfouri's Farm.		
	C.	S.	A.	C.	S.	A.	C.	S.	A.	C.	S.	A.	C.	S.	A.				C.	S.	A.	C.	S.	A.	C.	S.	A.
January	2	—	—	3	—	2	—	—	—	1	—	1	6	—	3	504	0.39	1.24	9	—	5	14	—	19	15	—	3
February	3	—	—	1	—	—	—	—	—	—	—	—	4	—	—	508	0.58	2.90	9	—	—	9	—	—	17	—	1
March	4	—	—	3	—	—	—	—	—	10	—	1	17	—	1	509	0.78	1.87	12	—	—	12	—	—	18	—	7
April	3	—	—	8	—	6	—	—	—	3	—	2	14	—	8	509	0.58	1.87	8	—	1	8	—	1	13	—	1
May	10	—	1	7	—	2	—	—	—	5	—	2	22	—	5	509	1.96	0.42	7	—	1	9	—	1	3	—	1
June	10	—	—	1	—	—	—	—	—	1	—	—	12	—	—	512	1.95	1.08	2	—	—	5	—	—	2	—	—
July	17	—	—	5	—	—	—	—	—	10	—	1	32	—	1	512	3.52	1.08	1	—	—	8	—	—	15	—	1
August	7	—	—	7	—	1	—	—	1	9	—	3	23	—	5	512	1.56	1.45	1	—	1	17	—	4	23	—	15
September	3	—	—	—	—	—	—	—	—	3	—	12	6	—	12	511	0.58	1.45	3	—	14	14	—	14	27	—	28
October....	2	—	—	—	—	—	—	—	—	4	—	12	6	—	12	513	0.39	1.45	13	—	19	13	—	9	38	—	27
November	3	—	—	1	—	—	—	—	—	1	—	1	5	—	1	514	0.58	1.03	—	—	17	16	—	16	19	—	6
December	3	—	—	—	—	—	—	—	—	—	—	1	3	—	1	516	0.58	1.63	—	—	—	25	—	8	9	—	—
TOTALS.	67	—	1	36	—	11	—	—	1	47	—	36	150	—	49	—	—	—	65	—	83	120	—	72	199	—	90

KHARTOUM.

QUARANTINE STATIONS — MOSQUITO STATEMENT FOR YEAR ENDING 31st DECEMBER, 1929.

MONTH 1929	White Nile Quarantine Station.													
	No. of vessels inspected.			No. of mosquito infections found.					No. of vessels and holds fumigated.			Undeveloped mosquito infections.		
				Adult.		Undeveloped.								
	Steamers.	Barges.	Native boats.	Few.	Many.	C.	S.	A.	Steamers.	Barges.	Total No. of holds.	Steamers.	Barges.	Native boats.
January	23	56	89	—	—	7	—	—	—	—	—	—	—	7
February	23	55	91	—	—	7	—	—	—	—	—	—	—	7
March	20	53	99	—	—	5	—	—	—	—	—	—	—	5
April	22	70	125	—	—	13	—	—	—	—	—	1	—	12
May	19	54	59	—	—	10	—	1	—	—	—	1	1	8
June	18	61	88	—	—	16	—	1	—	—	—	—	2	14
July	19	68	33	—	—	5	—	1	—	—	—	1	—	4
August	21	67	20	—	—	3	—	—	—	—	–	—	1	2
September	19	75	25	1	1	6	—	—	1	1	2	1	1	4
October....	18	60	41	1	—	4	—	—	1	—	1	1	—	3
November	23	50	88	—	—	15	—	—	—	—	—	2	—	13
December	21	74	118	—	—	10	—	—	—	—	—	8	—	2
TOTAL.	246	743	876	2	1	101	—	3	2	1	3	15	5	81

MONTH 1929	Blue Nile Quarantine Station.													
	No. of vessels inspected.			No. of mosquito infections found.					No. of vessels and holds fumigated			Undeveloped mosquito infections.		
				Adult.		Undeveloped.								
	Steamers.	Barges.	Native boats.	Few.	Many.	C.	S.	A.	Steamers.	Barges.	Total No. of holds.	Steamers.	Barges.	Native boats,
January	1	1	226	—	—	4	—	—	—	—	—	—	—	4
February	4	3	134	—	—	3	—	—	—	—	—	—	—	3
March	—	—	141	—	—	—	—	—	—	—	—	—	—	—
April	—	—	284	—	—	—	—	—	—	—	—	—	—	—
May	—	—	186	—	—	—	—	—	—	—	—	—	—	—
June	2	1	196	—	—	2	—	—	—	—	—	—	—	2
July	—	—	251	—	—	9	—	—	—	—	—	—	—	9
August	—	—	174	—	—	13	—	—	—	—	—	—	—	13
September	—	—	134	—	—	8	—	2	—	—	—	—	—	8
October	—	—	152	—	—	18	—	6	—	—	—	—	—	19
November	5	2	150	—	—	5	—	—	—	—	—	—	—	5
December	1	1	229	—	—	1	—	—	—	—	—	—	—	1
TOTAL.	13	8	2257	—	—	63	—	8	—	—	—	—	—	64

C. = Culex. S. = Stegomyia. A. = Anopheline.

VITAL STATISTICS.

The returns of births and deaths can only be considered to be in any way correct in Khartoum, Berber and Dongola Provinces and in Wadi-Halfa district. The returns for the Blue Nile Province are still very incomplete; they are included in the list given below, but it would not be safe to draw any conclusions from them:—

NON-EUROPEAN VITAL STATISTICS.

PROVINCE.	1926		1927		1928		1929	
	Total	Rate	Total	Rate	Total	Rate	Total	Rate
Khartoum :—								
Births	3709	18.9	3542	17.6	3646	15.3	4189	17.2
Deaths	2115	10.8	2567	12.8	2646	11.1	2519	10.7
Still births ..	115	31.5	114	31.7	133	38.7	157	37.1
Infantile .. .. mortality ..	216	60.0	310	86.1	274	79.8	281	66.4
Berber :—								
Births	4178	27.6	4271	28.2	4343	28.7	4721	31.2
Deaths	2952	19.5	2509	16.6	3453	22.8	3707	24.5
Still births ..	52	12.4	71	16.6	102	23.5	103	21.8
Infantile .. .. mortailty ..	297	71.0	333	77.9	373	85.9	341	72.2
Dongola :—								
Births	5476	33.5	5539	33.9	5678	34.8	5481	33.6
Deaths	2385	14.6	2323	14.2	2628	16.1	2451	15.0
Still births ..	235	42.9	228	41.1	262	46.1	309	52.7
Infantile .. .. mortality ..	455	83.1	430	77.6	458	78.9	464	84.6
Blue Nile :—								
Births	10331	31.7	13952	42.9	12449	38.2	11000	31.5
Deaths	6026	18.5	8562	26.3	9599	29.5	7784	22.1
Still births ..	151	14.6	182	13.0	169	13.5	171	15.5
Infantile .. .. mortality ..	473	45.8	471	43.8	572	45.9	432	39.3
Wadi Halfa Merkaz :—								
Births	688	15.2	776	17.2	688	15.2	746	16.5
Deaths	521	11.5	519	11.5	448	9.9	490	10.8
Still births ..	8	11.7	—	—	4	5.8	6	8.0
Infantile .. .. mortality ..	104	151.2	99	127.5	50	72.6	70	93.8

HEALTH & MEDICAL EXAMINATION OF SCHOOLS.

There are four different types of schools :—

(a) The village Koran schools.

(b) Elementary vernacular schools (usually in towns).

(c) Primary schools (in towns).

(d) The Gordon College, which is a secondary school.

Medical Examination at the Elementary Schools and Village Schools.

These schools are medically examined at least once a year ; records are confined to certain points, e.g. general phyisque, trachoma, bilharzia, ankylostomiasis, tuberculosis and splenic index.

Medical Examination at Primary Schools and the Gordon College

All pupils entering a primary school are examined on admission and during the second, third and fourth years. The following points are examined for, and recorded :— height, weight, chest measurement, general physique, condition of eyesight, heart, teeth and skin, and of the various organs of the body.

If the boy passes on to the Gordon College his medical card is sent with him and he receives a second card to record the examinations made on entering the college, and during the second, third and fourth years. If the boy on leaving the Gordon College enters Government services, the cards go with him and are included in his medical dossier.

Health of Schools.

Medical examinations of the pupils in one secondary, 10 primary, 57 elementary and 106 village Koran schools were carried out.

The percentage of pupils affected with certain diseases is shown in the appended table.

It will be seen from this table :—

(i) that the spleen rate was unusually high in the schools in the central Sudan. This is attributable to the heavy and widespread rains that fell over this area.

(ii) that no cases of tuberculosis, either pulmonary or non-pulmonary, were detected.

(iii) that the incidence of trachoma is high in the Halfa and Dongola schools. It is difficult to arrange for efficient treatment in the village schools. The masters are taught to carry out this work, and are supervised by the Medical Inspector whenever this is possible. It is probable that the net result is that these schools are not an active agency in spreading the disease as they would be otherwise.

The primary—and to a less extent—the elementary schools receive more constant supervision and the treatment definitely tends to diminish the incidence of the disease, but in Halfa and Dongola the disease tends to reestablish itself during the holidays.

(iv) the high incidence of bilharziasis in the schools of Halfa, Dongola, White Nile and Darfur Provinces is noticeable. The Dongola schools were previously as heavily infected as the schools of the other three provinces, and the lower incidence is the result of the systematic anti-bilharzia work which has been carried out in Dongola during he last five years.

Table showing percentage of pupils affected with certain diseases.

Province	Number Examined	% Trachoma	% Bilharzia	% Spleen	% Tuberculosis	% Ankylostoma
Khartoum Province :—						
Gordon College ..	300	11.8	1	1	—	0.3
Gordon College Workshops ..	27	—	—	—	—	—
Khartoum Primary..	150	11.0	2	3.3	—	—
Omdurman Primary	304	27.0	—	—	—	—
Berber Province :—						
2 Primary	217	44.2	2.3	4.2	—	—
8 Elementary ..	911	47.5	12.0	4.1	—	0.4
14 Village	826	65.5	4.0	4.8	—	—
Blue Nile Province :—						
2 Primary	214	5.6	0.5	21.5	—	—
10 Elementary ..	1065	27.2	0.2	19.0	—	—
2 Village	92	26.0	1.0	38.0	—	1.0
Kordofan Province :—						
1 Primary	108	9.2	3.7	28.7	—	—
12 Elementary ..	1116	2.1	11.3	30.2	—	—
3 Village	80	31.2	—	46.3	—	—
Kassala Province :—						
1 Elementary ..	85	15.0	0.8	40.0	—	—
5 Village	225	57.0	—	67.0	—	—
Halfa Province :—						
1 Primary	49	85.7	10.0	2.0	—	—
4 Elementary ..	407	95.0	28.2	5.1	—	8.4
34 Village	1000	96.6	39.7	6.4	—	15.8
Dongola Province :—						
5 Elementary ..	517	66.0	2.5	4.0	—	—
44 Village	2196	54.0	14.0	4.0	—	—
White Nile Province :—						
1 Primary	56	41.1	28.6	8.9	—	—
6 Elementary ..	519	37.4	30.5	23.7	—	—
3 Village	136	23.5	12.5	2.2	—	—
Upper Nile Province :—						
2 Elementary ..	151	11.9	0.7	29.1	—	—
Red Sea Province :—						
2 Primary	111	27.0	—	2.7	—	—
5 Elementary ..	597	12.2	0.8	1.0	—	—
Fung :—						
3 Elementary }	214	27.1	0.5	23.8	—	—
1 Village .. }						
Darfur :—						
1 Elementary ..	95	53.7	31.5	59.0	—	—

QUARANTINE.

The quarantine station was open from March 8th, 1929.

The labourers examined all came from Upper Egypt, chiefly from the neighbourhood of Luxor and Esna.

WADI HALFA HUMAN QUARANTINE, 1929 Season

A total of 6072 were examined, in comparison with 7743, in 1928.

Of these 670 (11.03%) were rejected and repatriated to Egypt. The rejections were due to :—

Bilharzia	639
Favus	6
Blindness	6
Extreme youth	5
Old age	2
Organic heart disease	6
Various	6

815 men were examined for bilharzia at Luxor prior to leaving Egypt and 12 of these (1.4%) were found to be infected with bilharzia on arrival at Wadi-Halfa; of the 5257 who had not been examined before leaving Egypt, 627 (11.9%) were suffering from bilharzia, and were repatriated. In 1927, before arrangements had been made for this examination at Luxor, 22.2% were found to be infected.

The following table shows the percentages of labourers showing certain symptoms and infestations, in comparison with 1928 :—

	Haematuria %	Bilhar. ova %	Oxyuris %	Ankyl. %	Ascaris %	Taenia %	Enlarged spleen %
1929	10.52	10.50	6.58	9.[illegible]4	3.17	3.02	.25
1928	12.0	11.9	18.2	18.0	5.8	3.6	.6

The following list shews the numbers, dates and destinations of the various batches of labourers passed through the quarantine :—

No. in Batch	Date			Destination
266	8th.	March	1929	Khartoum
312	21st.	,,	,,	Abu Ushur, Khartoum
233	14th.	April	,,	,, ,,
50	25th.	June	,,	Port Sudan
100	26th.	Sept.	,,	Gedaref
531	4th.	October	,,	Korashi & Makwar
237	12th.	,,	,,	Om Dam
609	16th.	,,	,,	Korashi & Makwar
625	4th.	November	,,	Barakat, Turabi, Makwar
634	17th.	,,	,,	Aroma, Turabi, Makwar
542	3rd.	December	,,	Turabi
50	8th.	,,	,,	Atbara
539	9th.	,,	,,	Makwar & Maleig
321	29th.	,,	,,	Maleig, Aroma, Turabi
400	22nd.	January	1930	Rehab & Hasseira
570	27th.	,,	,,	Barakat
57	31st.	,,	,,	Semna
6076				

PILGRIM QUARANTINE (SUAKIN).

The 1929 pilgrimage was declared to be clean, i.e., uninfected with plague or cholera. The number of pilgrims passing through the quarantine station showed a further increase from previous years, the total being 4038 as against 3444 in 1928, and 1608 in 1927. All the departing pilgrims were vaccinated against small-pox, and inoculated against cholera. They had all paid for their return tickets, and for their quarantine charges.

A large number of pilgrims continue to pass from the Sudan into Eritrea, so as to avoid the heavier charges of a return passage on a steamship, and to avoid paying quarantine dues in advance.

It is thought that it would be useful to give a short summary of the work that has been carried out at the Suakin pilgrim quarantine since this was taken over from the Egyptian Quarantine Board in January 1927.

NOTE ON THE WORK OF THE SUAKIN PILGRIM QUARANTINE FROM 1.1.1927 TO 31.12.1929.

This station, which had previously been under the administration of the International Quarantine Board of Egypt was taken over by the Sudan Medical Service on 1st January 1927.

The following additions to buildings and to the water supply and drainage system were commenced as soon as possible after the transfer, and were for the most part completed before the arrival of the pilgrims in June 1927.

(i) The existing hospital was enlarged to provide accommodation for additional patients and for a clinical laboratory ; and a second storey was added to provide living accommodation for a British doctor.

(ii) An isolation hospital was built in one of the isolation sections (this was not completed until June 1928).

(iii) Wooden shelters were built in the sections so as to provide more adequate protection for the pilgrims.

(iv) The water supply was increased by the provision of additional and higher tank accomodation.

(v) An electric lighting system was installed to replace the oil lamps previously used.

(vi) Alterations were made to the latrines and sewage disposal system. These alterations however, failed to rectify the existing conditions, and a complete reconstruction of the drainage system was completed in the spring of 1929.

Arrangements at the Departure of Pilgrims for the Hedjaz.

The departing pilgrims had, previously to the tranfers of administration been vaccinated against small-pox and inoculated against cholera by the Sudan Medical Service, but it had not been possible to insist on a return ticket being taken owing to the high charges made for quarantine and for steamer transport.

On the completion of the transfer, however, it was possible to make the following reductions and so to meet the difficulty to some extent :—

(i) The quarantine fees were reduced from 108 piastres to 50 piastres, and this reduced charge was made to include landing and ferry charges, which were previously additional to the quarantine charge.

(ii) An arrangement was made with a line of steamers to take the pilgrims at a reduced rate.

In spite, however, of these reductions, the insistence on the purchase of a return ticket involved a considerable increase in total charges.

The total sum to be provided by each pilgrim became 297 piastres, approximately £.3.1.0.

This sum is made up as follows :—

	piastres
Return steamer fare	120
Hedjaz	97
Sudan consolidated charge	80

The Sudan consolidated charge is made up as follows :—

	piastres
Quarantine fees (including landing charges)	50
Passport	5
Food	10
Cash to be handed to pilgrims on departure	15
Total	80

Each pilgrim before leaving for the Hedjaz is :—

(i) vaccinated.

(ii) inoculated against cholera (a single inoculation).

(iii) given a passport on which is his photograph and which shows that he has paid :—

(a) the Hedjaz quarantine fee.

(b) the return steamer fare.

(c) the Sudan consolidated fee.

Return of Pilgrims.

The bulk of the pilgrims at present return in June, July and August, but they continue to return in small numbers until the end of the year.

On arrival the pilgrims are disembarked from their ship ; they are medically inspected—any sick being sent to hospital, and their clothes and other belongings are disinfected ; they themselves are given a bath, redress in their disinfected clothes and are sent with their belongings to one of the sections where they are kept isolated separately from pilgrims who have arrived on other ships, for a period of five days. On completion of this period, if no case of plague or cholera has occurred, they are refunded the balance of their deposit and are allowed to proceed on their journey.

QUARANTINE SEASON 1927.

Departure.

A total of 1732 pilgrims left for the Hedjaz as against 1559 in 1926.

They all left by steamer, they had all taken a return ticket, and they had all been vaccinated against small-pox and inoculated against cholera.

Return.

A total of 1608 pilgrims returned between June and December in steamers, and 1119 destitute pilgrims returned in sailing vessels.

Of these 1119 destitutes 1055 had left via Massowah in sailing vessels, the rest had remained in the Hedjaz from previous pilgrimages.

Of the 1608 pilgrims who returned by steamship, 623 were West Africans, and 985 were natives of the Sudan. Those returning by sailing vessels were all West Africans.

The improved accommodation in the sections appeared to be much appreciated by the pilgrims.

QUARANTINE SEASON 1928.

Departure.

A total of 3237 pilgrims left for the Hedjaz as against 1732 in 1927. They had all been vaccinated against small-pox, inoculated against cholera, and had paid their return fare and quarantine charges.

Return.

A total of 3444 returned (including 320 passengers treated as pilgrims) as against 2727 returned in 1927.

This total was composed as follows :—

Natives of the Sudan	948	684	men
		254	women
		10	children
West Africans	1856	960	men
		724	women
		172	children

The number of pilgrims who left via Massowah and returned by Suakin was 97. This compares favourably with 1055 in 1927.

Only 20 pilgrims returned by sailing ship as compared with 1119 in 1927.

Thirty four pilgrims were admitted to hospital, and eight died.

QUARANTINE SEASON 1929.

Departure.

A total of 3866 pilgrims left for the Hedjaz. This compares with 3237 in 1928, and 1732 in 1927.

This total was composed as follows :—

Sudanese	1324	3866
West Africans	2542	

The composition of this total as regards sex and age was as follows :—

Men	2159	3866
Women	1374	
Children	333	

All the departing pilgrims were vaccinated against small-pox and inoculated against cholera. They had all paid for their return fare and for their Sudan and Hedjaz quarantine charges.

Return.

A total of 4038 persons returned to Suakin from the Hedjaz ; of these 3862 were pilgrims, the remaining 356 were passengers, but were treated as pilgrims for quarantine purposes.

No pilgrims left or returned in sailing vessels.

Thirty three pilgrims who had left via Massowah returned to Suakin. They were destitute and were unable to pay quarantine dues.

A total of 48 pilgrims were admitted to hospital ; of these nine died.

SHIPPING QUARANTINE.

The following tables show the shipping dealt with at Port Sudan and Suakin in 1929 and previous years :—

PORT SUDAN.

	1926	1927	1928	1929
Ships entering	820	845	932	885
Sambuks ,, ...	393	562	633	526
Warships entering	20	27	20	28
Ships quarantined	—	2	12	—

SUAKIN.

	1928	1929
Ships entering	37	37
Sambuks ,, ...	219	134

SUDAN MEDICAL SERVICE STAFF.

1929.

Appointment	Establishment
Medical Staff :—	
Director	1
Senior Surgeon	1
Senior Physician	1
Assistant Director	1
Medical Officer of Health, Khartoum	1
Senior Medical Inspectors	2
Medical Inspectors	27
Medical Officers (Syrians)	42
Medical Officers (Sudanese)	14
Dispensary Hakims (Sudanese)	68
Sanitary Hakims (Sudanese)	82
Dispensers	7
Radiographer	1
Assistant Radiographer	1
Laboratory Assistants	6
Midwife	1
Nursing Staff :—	
Matron, Khartoum Civil Hospital	1
Matron, Omdurman Civil Hospital	1
Assistant Matron, Wad-Medani Civil Hospital	1
Inspectress of Midwives	1
Nursing Sisters	10
Sanitary Staff :—	
Chief Sanitary Inspector	1
Senior Sanitary Inspectors	5
Sanitary Inspectors	16
Native Sanitary Inspectors	3
Sanitary Overseers (Sudanese)	3
Clerical Staff :—	
Chief Clerk	1
Clerk (British)	1
Translator (Grade V)	1
Translators (Grade VI)	3
Translators (Grade VII)	9
Translators (Grade VIII)	4
Clerks (Grade VII)	10
Clerks (Grade VIII)	21
Chief Accountant (Grade V)	1
Accountant (Grade VI)	1
Accountants (Grade VII)	6
Accountants (Grade VIII)	3
Stores Staff :—	
Medical Storekeepers	2
Asst. Medical Storekeeper	1
Storemen (Sudanese)	3
Tailors	2
Carpenters	2

CHANGES IN PERSONNEL.

The following changes in personnel occurred during 1929 :—

Medical Inspectors :—

Mr. R. C. Jones	Resigned	6. 1.1929
Mr. D. R. Gawler	,,	17. 4.1929
Mr. J. Bryant	Appointed	2. 4.1929
Mr. F. B. Turner	,,	2. 4.1929
Mr. H. J. Satchwell	,,	22. 7.1929
Mr. C. B. Drew	,,	8. 9.1929
Mr. J. S. Aldridge	,,	29. 9.1929
Mr. E. W. T. Morris	,,	29.12.1929

Medical Officers (non-Sudanese) :—

Yusb. Rudah Eff. Karsa	Died	13. 6.1929
Dr. A. H. Injejikian	Discharged	20. 6.1929
Dr. Rushdi Jabi	,,	23. 6.1929
M. A. Michel Eff. Farhat	From S.D.F.	28. 8.1929

Medical Officers (Sudanese) :—

Dr. Ali Mohamed Khair	Appointed	1. 1.1929
Dr. Mukhtar Mohamed Mahmud	,,	,,
Dr. Ali Arbab	,,	,,
Dr. Ibrahim Anis	,,	,,
Dr. Hassan el Hakim	,,	,,
Dr. Ali Ahmed Bahreiba	,,	,,
Dr. Ahmed Abdel Halim	,,	,,

Medical Officers (Sleeping Sickness) :—

M. A. Emmanuel Eff. Terzian	To S.D.F.	11. 3.1929
M. A. Tewfik Eff. Minassian	,,	7. 4.1929
M. A. Joseph Eff. Trabolsi	From S.D.F.	10. 5.1929
M. A. Souran Eff. Soukissian	,,	21.10.1929
M. A. Kratchia Eff. Papazian	,,	7.12.1929

Sanitary Inspectors :—

Mr. T. Dinning	Appointed	7. 4.1929
Mr. E. Jane	,,	12. 6.1929
Mr. G. L. Evatt	,,	28. 6.1929
Mr. R. Charlton	,,	19. 8.1929
Mr. A. W. E. Porter	Discharged	8.12.1929

Dispensary Hakims :—

Four were appointed, one was discharged, and one was invalided.

Sanitary Hakims :—

Twenty-five were appointed, four were discharged, two resigned, and two died.

TRAINING.

KITCHENER SCHOOL OF MEDICINE.

It will be recalled that no new students were admitted to the school in 1926, but that since then new students have been admitted each year. In consequence of the absence of a first year class in 1926 there was in turn no 4th year class in 1929.

Three students had failed to satisfy the examiners in the examination in the 1st year subjects at the end of 1928, and had been referred for a further period of one year. Nine additional students were admitted to the school in January, 1929 thus constituting a 1st year class of 12 students. In all twenty-five students were under tuition in 1929. The classes were constituted as follows :—

	Students.
1st. Year.	
Chemistry, Physics and Biology	12
2nd. Year.	
Anatomy and Physiology. Applied Anatomy and Applied Physiology	7
3rd. Year.	
Medicine, Surgery and Pathology	6
4th. Year.	
No class	—
TOTAL	25

The arrangement referred to in last year's report by which a Biologist was appointed to the staff of the Education Department, whose primary duty would be to teach biology to the first year students of the Medical School and who would also teach the same subject to the fourth year science class at the Gordon College has resulted in more effective tuition in this subject, and the beneficial results of this training should be further evidenced as the students who have been taught by him at the Gordon College continue their studies under the same teacher at the School of Medicine.

Examination in 1st year Subjects.

The 1st year class was examined by external examiners selected in the Sudan. These were selected from the Government staff of Biologists and Chemists engaged in agricultural research.

Twelve students were examined ; of these eight satisfied the examiners and will constitute the second year class in 1930. Of the four students who failed, three had been referred in 1928. The School Council, on the advice of the teachers and the examiners, decided that these four students had not the mental equipment necessary for a medical career and that they should therefore discontinue their medical studies. Work was found for them elsewhere.

Examination in 2nd year Subjects.

In the absence of a final year examination it was decided to seize this opportunity to obtain Assessors in Anatomy and Physiology so that we might have expert opinion from outside the Sudan as to the standard maintained in these subjects. We were fortunate in being able to obtain for this purpose the services of Professor Derry, Professor of Anatomy at the Kasr-el-Aini University of Egypt, as Senior Assessor and Assessor in Anatomy, and of Professor Raiment, Professor of Physiology at the same University as Assessor in Physiology. Our curriculum extends over a period of four years as against the five years course which is obligatory in Great Britain and many other countries. One year is spent over the preliminary subjects and two years over the professional subjects as in England, but the teaching in Anatomy and Physiology is compressed into one year. It was especially desired to obtain the opinion of the Assessors as to the desirability of maintaining this arrangement, or on the other hand of extending the course for a further year. In order to get a more informed opinion on this point we asked the assessors also to conduct an informal viva voce examination on the 3rd year students, who ordinarily do not come up for examination at the end of the 3rd year, with a view to ascertaining to what extent they remembered and made use of their Anatomy and Physiology in their professional studies.

Seven students came up for examination in Anatomy and Physiology and of these six satisfied the examiners. The School Council decided that the seventh student, who had failed to reach the standard required, should discontinue his medical studies and work was found for him elsewhere. The reports of the assessors are given *in extenso* below.

As regards the question put to them as to the desirability of increasing the length of the curriculum by an additional year spent in the study of Anatomy and Physiology, the Assessors replied that owing to the close individual attention that it was possible for lecturers in these subjects to give to the small number of students under tuition, they considered that the students were in fact acquiring a sufficiently wide knowledge of Anatomy and Physiology to enable them to study the strictly professional subjects to the best advantage. They therefore advised that it was not necessary or advisable, under the existing circumstances, to extend the length of the curriculum.

Students' Library Fund.

During the summer vacation the students, entirely on their own initiative, decided to give a dramatic entertainment and so to raise funds for the purpose of providing additional books and periodicals for the school library. With this object they wrote a play and acted it before native audiences, first in Khartoum and then in Wad-Medani, and a sum of £E. 288 was thus realised. The project was carried out from first to last without advice or assistance from the school staff, and its successful execution points to energy, initiative and power of organisation.

Progress of Doctors subsequent to graduation.

It will be recalled that seven students graduated in January, 1928 and were posted as house-physicians and house-surgeons at six of the larger hospitals and that, at the end of the year, six of these, who were well reported on, were appointed to the rank of Sudanese Medical Officer and were posted to the sole charge of six of the smaller hospitals, but that the seventh, who had not shewn sufficient energy and initiative, was retained for a further year's experience as a house officer. The six who were promoted and posted to the charge of hospitals have fully justified their appointment to these posts of responsibility. The seventh, under the stimulation of deferred advancement, has steadily improved to an extent that fully justified his promotion at the end of the year. Of the seven doctors who graduated in January 1929, and were similarly posted as house-physicians and house-surgeons, six were well reported on at the end of the year and received their promotion; the seventh was reported on as having fallen short of the standard required, and his promotion is being postponed for a further probationary period. The six newly promoted Sudanese medical officers will carry out reliefs at various hospitals during the year, pending definite posting. Thus, up to the end of 1929, fourteen doctors had graduated at the School of Medicine. Of these thirteen had been promoted to be Sudanese medical officers while the fourteenth had been referred for a further period of probation as a house-officer. Six of the Sudanese medical officers had, for a year, been in sole charge of small hospitals and had carried out their duties to the entire satisfaction of their British Medical Inspectors.

ASSESSORS' REPORTS.

(A) Anatomy.

"Of the seven students who sat for the above examination only one failed. Four of the six who passed attained a standard equivalent to that demanded by the Conjoint Board of the Royal College of Surgeons and Physicians. The remaining two did not reach the standard referred to above, but were considered fit to pass on the standard required here.

"The wide extent of the knowledge displayed both in the paper and in the examination on the dissected body had not been expected in view of the comparatively short period during which the students have studied the subject, and the results speak very highly, both for the constant personal supervision of their work by the teacher, and the close attention paid to it by the students themselves.

"At the same time they experienced difficulty in transferring their knowledge of a given part to the living subject, and also shewed inability to make proper use of bony or other landmarks to assist them in correctly recognising the position of the subjacent structures. This was even more noticeable in the 3rd. Year students who while correctly describing the anatomy of a part in its association with disease or injury, were unable to define the surface landmarks which must be employed if a correct diagnosis is to be made. In other words they do not sufficiently associate their anatomical knowledge with the facts they state.

"Under the conditions at present prevailng, in which the students' time for the study of anatomy and physiology is limited to a year, I am of the opinion that greater attention should be paid to surface anatomy, and that during the dissection of a given part there should be constant reference to the living body, in order that the student may understand the reason of the work he is doing, and may acquire from the outset the habit of making mental pictures of what he is learning in the dissecting room, and of transferring these to the living subject. This has the double advantage of enhancing the interest of the work and of impressing on the student's mind the uses to be made of anatomy in his future surgical and medical studies. Such a method of instruction is all the more essential where the habit of mind is not naturally deductive, and where the tendency to treat a subject such as anatomy as something to be learned and dismissed without association with future work is very marked.

"In conclusion I should like to express my thanks to all of those with whom I have been associated while conducting the examination for their unfailing courtesy and assistance. The impression left on my mind in regard to the students themselves is that they have been well and thoroughly taught, and I believe that the efforts now being made to provide capable medical men for service in the Sudan has already more than justified its initiation."

(Sgd.) Douglas G. Derry.

(B) Pysiology.

"Having been honoured by the request of the Sudan Government to act as Examiner in Physiology at the Intermediate Examination in Medicine held at Khartoum in December, 1929, I now beg to present to you my report.

1. The Scope of the Examination.

"The examination consisted of one written paper of three hours' duration, a practical examination in Histology, Experimental Physiology and Biochemistry lasting in all five hours, and a viva voce examination of each candidate of approximately half an hour. The written paper consisted of six questions, of which the candidate was required to answer five.

"The standard of these questions was approximately similar to those set by a body such as the Conjoint Examining Board for England of the Royal Colleges of Physicians and Surgeons. In the practical examination the candidate was required to stain and mount a fresh preparation and to perform certain simple experiments in Physiology and Biochemistry. In setting these experiments I continually kept it in my mind that the candidates were aiming at qualification in medicine and I asked them to perform such tasks as they might reasonably be called upon to perform in the execution of their duties.

2. The Candidates.

"Of the seven candidates that I examined, three reached a very high standard and would have passed a similar examination of the Conjoint Board in England—indeed the first two in order of merit would have passed the University Examination in Egypt. Of the remaining four, three reached a standard which assured me that they had sufficient knowledge to profit by clinical work, so I approved them. One, alone, fell below the standard and was accordingly rejected.

"Of the general demeanour of all the candidates, I can only speak in terms of congratulation. Having regard to the fact that their course in Physiology only lasts over a period of eight working months, I consider that their knowledge reflects immense credit upon all who have been responsible for their instruction. Their written papers shew that they have been soundly grounded in the fundamentals of the science of Physiology, their tutor having, very wisely, avoided any waste of time over the more theoretical or academic side of the subject. In their practical work they were neat and clean and they tackled each problem set them in a workmanlike and expeditious manner.

3. The Future.

"If I may, without presumption, speak of the future, there are one or two small alterations that might be made which would, in my opinion, assist materially in helping the student in the acquisition of Physiological knowledge. On this occasion it was not possible to examine the student practically in the muscle-nerve part of Experimental Physiology owing to the lack of apparatus. At the moment the School possesses only one Kymograph. The result of this is that only one student at a time can perform an experiment. This drawback must lead to a considerable waste of time in the work and I would suggest that the equipment should be increased so that at least four drums are available.

"The other point to which I wish to draw attention is the discrepancy which existed between the ease with which the candidate answered the written paper, and the difficulty he seemed to find in answering similar questions when put to him verbally. Making all due allowance for the difficulties in language and the nervousness which is inseparable from a viva voce examination I think there is room for improvement in that part of the examination. How far this difficulty is met by giving viva voce classes during the course of instruction I do not know, but if such classes are already existent I think their number should be increased, and if non-existent then some such class should be tried as an experiment.

EXAMINATION OF SENIOR STUDENTS.

" I was also privileged to examine the candidates who passed in Anatomy and Physiology last year, and who had spent one year in hospital work.

" To each of these six candidates I gave a viva voce examination lasting approximately half an hour. This examination was an endeavour to discover how far the student was capable of supplying the principles of physiology to he detection and treatment of morbid conditions.

" The result of the examination was that I was able to mark two candidates as "very good," one as "good" and three as "fair." I found that they had retained quite a good knowledge of Physiology, but that they were not quick at seeing the relation between normal Physiology and a pathological condition. Their most common fault was the failure to correlate observed facts with possible causes. Thus: albumen in the urine was a disease " per se," no attempt being made to envisage the fundamental cause of damage to the kidney cells. One other point that I especially noted was their weakness in answering any questions concerning the practical problems of dietetics. Otherwise I consider that these candidates have carried with them into the wards a very good appreciation of the fundamental facts of the science of Physiology.

" In conclusion, I wish to express my grateful thanks to all the staff for their assistance during the course of the examination."

(Sgd.) Percy C. Raiment.

MIDWIFERY TRAINING SCHOOL.

Owing to the severe illness of the Inspectress of Midwives, Miss M. Wolff, the training work of both midwives and nurses was severely hampered during the earlier part of the year, because her sister, Miss G. Wolff, who was in charge of the Nurses Training School, had to carry on both sides of the work until an assistant who had the requisite teaching experience and knowledge of Arabic could be obtained. In spite of this difficulty fifteen midwives, drawn from various provinces of the Sudan, completed their training and returned to practise their calling in their own villages.

It had become obvious that the work of training and supervising midwives throughout the Sudan had grown beyond the capacity of a single person, however able and energetic; in consequence of this it was decided to transfer Miss G. Wolff from the Nurses Training School and to appoint her to the post of Assistant Superintendent of Midwives to assist her sister. This new appointment should prove of great advantage to the midwifery training work, as it will enable a greater number of midwives to be trained each year and it will enable the trained midwives who are working in distant provinces to be inspected more frequently; some of these midwives have perforce remained uninspected by the Inspectress for several years together. They are very few and they work in great isolation, having to encounter the opposition of the older women who are obstinately wedded to their undesirable methods of delivery and after treatment, and rootedly opposed to all innovation. The two essentials are more trained midwives and more frequent inspection; inspection means encouragement to persevere in the practice of the clean midwifery taught at the school, in the face of much opposition and discouragement. Omdurman has now for some years been served entirely by midwives trained at the school and the result is shewn by a decreasing rate of puerperal sepsis and of other puerperal accidents and a decreasing infantile mortality. This advantage should be extended to the whole northern and central Sudan. In the provinces with fewer doctors and a greater conservatism it is even more needed than in Khartoum Province.

The midwives trained at this school do not constitute an extraneous agency, they are the children and the grand-children of the village or tribal midwives, they return after training to work in their own villages, they have the entry to every hut and they should prove to be a great power for enlightenment where it is most needed among the most conservative element of all, the woman of the villages.

NURSES' TRAINING SCHOOL.

This training school is making slow but steady progress. Great difficulty is being experienced in getting a suitable type of girl for training, and still further difficulty is experienced in persuading the probationers, when selected, to submit to the strict discipline of a nurse's duties. The girls selected are, in almost every case, illiterate and have to be taught to read and write correctly with their other duties.

A certain number of nurses who have completed their training resign in order to get married. This is to be expected. Similar difficulties were experienced with regard to the midwifery training school and those were eventually overcome, and no doubt a similar persistence will, in this also, lead to success.

There are certain factors, however, that make the position with regard to nurses more difficult:—

(i) The course is for two years instead of six months.

(ii) The training involves a stricter discipline and more regular hours.

(iii) In the case of midwives, a class of hereditary midwives already existed and it was not considered necessary or desirable to go beyond this class. The younger midwives or the daughters of the old midwives were persuaded, at first with great difficulty, to come for training; it was a shock to their conservatism but it was in accordance with their traditions. They were practising their calling, but in a different way. In the case of nurses the matter is more difficult. We are trying to persuade Sudanese Arabs to send their daughters to be trained in a profession that is looked down on as unsuitable for Arab women ; to come at a time when they should be married and having children ; to submit to discipline ; to obey instantly and to move quickly, and finally to read and write, all of which are beyond or contrary to their training or tradition.

A great deal of prejudice will have to be overcome and an altered outlook achieved before the best type of girl can be enlisted for this work and can be persuaded to submit to the discipline, regularity and activity of a nurse's life. In the meanwhile some progress is being made towards this end.

Eighteen nurses were under training during the year : of these three completed their training, five resigned or were discharged and ten are continuing their course for another year. Twelve new probationers will join the class for 1930. There will thus be twenty-two probationers under training in 1930. Up to date seventeen new nurses have completed their course of training. Of these five are employed as trained nurses at Omdurman hospital, seven are employed at provincial hospitals and five have resigned. The nurses who have completed their training are much in request for work in the provinces as being more competent than any female attendants that can be obtained and trained locally.

(Sgd.) O. F. H. ATKEY,
Director, Sudan Medical Service.

Khartoum.
15.4.1930.

PRIVATE PRACTITIONERS.

The following private practitioners were practising in the Sudan at the end of 1929 :—

PHYSICIANS.		DENTISTS.		PHARMACISTS.	
British	6	British	1	Greek	1
Greek	4	Greek	2	Syrian	2
Syrian	2	Syrian	2	Armenian	1
		Armenian	2		

The following list shows where they were practising :—

KHARTOUM.

Physicians :—

Greek	2
Syrian	2

Dentists :—

British	1
Greek	2
Syrian	2
Armenian	1

Pharmacists :—

Greek	1
Syrian	2
Armenian	1

OMDURMAN.

Physicians :—

British (including one medical woman—all Church Missionary Society)	3

PORT SUDAN.

Dentists :—

Armenian	1

WAD-MEDANI.

Physicians :—

Greek	2

MELUT (Upper Nile Province).

Physicians :—

British (Sudan United Mission)	1

ATWOT (Upper Nile Province).

Physicians :—

British (Church Missionary Society—Medical woman)	1

YILU (Mongalla Province).

Physicians :—

British (Church Missionary Society)	1

TABLE I.

Shows the admissions and deaths by disease.

	DISEASE.	TOTAL.							
		Europeans.				Natives.			
		Male.		Female.		Male.		Female.	
		A.	D.	A.	D.	A.	D.	A.	D.
	Table "A"								
	Tubercular								
1.	Disease of lung	1	—	1	—	251	35	49	3
2.	All other tubercular diseases ...	—	—	—	—	232	22	90	3
	Venereal								
3.	Syphilis	3	—	—	—	2,105	10	1,256	3
4.	Gonorrhoea	10	—	—	—	1,545	—	255	—
5.	Soft Sore	2	—	—	—	152	—	4	—
	Eye.								
6.	Trachoma...	—	—	1	—	223	—	67	—
7.	All other eye diseases	5	—	—	—	1,105	—	476	—
8.	**Ear**	4	—	3	—	169	1	30	—
9.	**Skin**	6	—	—	—	629	—	335	—
10.	**Wounds and other injuries** ...	90	3	7	—	9,399	127	1,456	29
	Tumours.								
11.	Malignant	1	—	—	—	87	13	56	9
12.	Non-Malignant	—	—	—	—	231	2	65	3
	Of Women.								
13.	Gynaecological	—	—	13	—	—	—	277	8
14.	Confinements	—	—	36	1	—	—	139	7
15.	**Poisoning**	1	—	—	—	34	8	15	—
	Total Table "A" ...	123	3	61	1	16,162	218	4,570	65
	Table "B" (Tropical).								
1.	Ankylostomiasis	—	—	—	—	34	—	5	—
2.	Bilharziasis	—	—	—	—	674	—	18	—
3.	Blackwater Fever	5	—	—	—	25	8	—	—
4.	Dysentery, Amoebic	14	—	4	—	1,221	55	208	6
5.	Dysentery, Bacillary	18	—	8	—	239	18	23	2
6.	Filariasis	—	—	—	—	44	1	3	—
7.	Madura disease	—	—	—	—	263	2	38	—
8.	Malaria	108	2	4	—	8,881	101	517	21
9.	Leishmaniasis (Kala-Azar) ...	—	—	—	—	75	25	6	1
10.	Trypanosomiasis...	—	—	—	—	—	—	—	—
11.	Yaws	—	—	—	—	196	1	113	—
12.	Sunstroke...	1	—	—	—	—	—	—	—
13.	Heatstroke	—	—	—	—	—	—	—	—
14.	Guinea Worm	1	—	—	—	345	—	25	—
	Total Table "B"	147	2	16	—	12,005	212	956	30

TABLE I. (*Continued*).

Disease.	TOTAL.							
	Europeans.				Natives.			
	Male.		Female.		Male.		Female.	
	A.	D.	A.	D.	A.	D.	A.	D.
Table " C " (Infective).								
1. Anthrax	—	—	—	—	—	1	—	—
2. Beri-Beri	—	—	—	—	5	—	—	—
3. Cerebrospinal Meningitis ...	—	—	—	—	37	22	13	7
4. Chicken Pox	—	—	—	—	562	4	18	—
5. Cholera	—	—	—	—	—	—	—	—
6. Dengue	—	—	—	—	2	—	—	—
7. Diphtheria...	5	—	1	—	55	16	90	13
8. Enteric (Including Paratyphoid)	5	—	—	—	39	9	22	4
9. Erysipelas	1	1	—	—	6	2	7	2
10. Gastro-enteritis of children ...	—	—	—	—	8	—	—	—
11. German Measles	—	—	—	—	—	—	—	—
12. Influenza	8	—	—	—	446	3	16	—
13. Leprosy	—	—	—	—	95	8	29	3
14. Malta Fever	—	—	—	—	26	4	1	—
15. Measles	1	—	—	—	184	1	33	1
16. Mumps	—	—	—	—	577	1	23	—
17. Pellagra	—	—	—	—	1	—	1	1
18. Puerperal Fever	—	—	—	—	—	—	22	7
19. Phlebotomus	2	—	1	—	20	—	2	—
20. Plague	—	—	—	—	—	—	—	—
21. Pneumonia (Epidemic)	5	1	—	—	560	115	67	12
22. Rabies *	1	—	—	—	8	1	7	—
23. Relapsing Fever	—	—	—	—	—	—	—	—
24. Rheumatic Fever	6	—	—	—	130	1	27	1
25. Scarlet Fever	—	—	—	—	—	—	—	—
26. Small Pox	—	—	—	—	164	51	94	28
27. Tetanus	—	—	—	—	9	7	4	3
28. Typhus	—	—	—	—	—	—	—	—
29. Whooping Cough	—	—	—	—	14	—	8	1
Total Table " C " ...	34	2	2	—	2,965	240	484	83
Table " D."								
1. Circulatory System	12	1	—	—	465	53	120	20
2. Respiratory System	17	—	—	—	1,854	74	273	14
3. Alimentary System	115	1	8	—	2,205	136	441	24
4. Genito-Urinary System	17	1	—	—	848	61	125	13
5. Nervous System	12	—	3	—	391	17	64	4
6. Scurvy	—	—	—	—	45	3	—	—
7. Diabetes	1	1	—	—	52	2	9	—
8. Fever of uncertain origin ...	18	—	3	—	404	41	66	2
9. All other diseases	23	—	3	—	687	19	227	9
Total Table " D "	215	4	17	—	6,951	406	1,325	86
,, ,, " A "	123	3	61	1	16,162	218	4,570	65
,, ,, " B "	147	2	16	—	12,005	212	956	30
,, ,, " C "	34	2	2	—	2,965	240	484	83
Grand Total	519	11	96	1	38,083	1,076	7,335	264

*Includes those admitted for Anti-rabic treatment.

TABLE II.

Shows admissions and deaths in hospitals during 1929.

	EUROPEAN.			NATIVE.		
	Adm.	Died	%	Adm.	Died.	%
Bahr el Ghazal :—						
Wau	4	—	—	1,577	39	2.5
Rumbek	—	—	—	308	4	1·3
Raga	—	—	—	350	5	1.4
Tembura	—	—	—	754	2	0.3
Aweil	—	—	—	200	5	1.5
Yambio	—	—	—	386	4	1.0
Berber Province :—						
Atbara	110	—	—	1,645	43	2.5
Abu Hamed	—	—	—	212	—	—
Shendi	—	—	—	481	2	0.4
Blue Nile Province :—						
Wad Medani	121	1	0.8	6,035	210	3.5
Makwar	12	—	—	1,805	66	3.7
Darfur Province :—						
El Fasher	1	—	—	1,075	56	5.2
Geneina	—	—	—	289	27	9.3
Nyala	1	—	—	156	8	5.1
Dongola Province :—						
Merowe	—	—	—	708	22	3·1
Dongola	—	—	—	465	7	1.5
Fung Province :—						
Singa	—	—	—	575	22	3.8
Roseires	—	—	—	287	11	3.8
Kurmuk	—	—	—	211	—	—
Halfa Province :—						
Wadi Halfa	5	—	—	498	18	3.6
Kassala Province :—						
Kassala	7	—	—	2,899	159	5.4
Gedaref	—	—	—	1,133	69	6.1
Galaat-el-Nahl	—	—	—	87	1	1.1
Abu Deleig	—	—	—	57	—	—
Aroma	—	—	—	389	6	1.5
Derudeb	—	—	—	238	1	0.4
Goz Rageb	—	—	—	73	—	—
Khashm el Girba ..	—	—	—	128	2	1.6
Gallabat	—	—	—	22	1	4.5
Hawata	—	—	—	460	1	0.2
Doka	—	—	—	28	—	—
Showak	—	—	—	18	—	—
Tokar	—	—	—	116	1	0.9
Gebeit	—	—	—	190	2	1.1

TABLE II—(*Continued*).

	EUROPEAN.			NATIVE.		
	Adm.	Died.	%	Adm.	Died.	%
Khartoum Province :—						
Khartoum	193	6	3.1	2,813	92	3.2
Khartoum North . .	—	—	—	1,246	11	0.9
Central Prison	—	—	—	369	4	1.1
Omdurman	—	—	—	2,315	76	3.3
Kordofan Province :—						
El Obeid	2	—	—	1,629	35	2.1
Nahud	—	—	—	854	15	1.7
Bara	—	—	—	61	—	—
Talodi	—	—	—	393	12	3.1
Dilling	—	—	—	616	7	1.1
Rashad	—	—	—	195	1	0.5
Kadugli	—	—	—	344	12	3.5
Delami	—	—	—	54	2	3.7
Mongalla Province :—						
Mongalla	—	—	—	468	26	5.5
Rejaf	—	—	—	194	7	3.6
Ikotos	—	—	—	203	—	—
Nimule	—	—	—	60	—	—
Meridi	—	—	—	283	4	1.4
Kajo-Kaji	—	—	—	428	14	3.3
Yei	6	—	—	421	11	2.6
Kapoeta	—	—	—	331	2	0.6
Torit	1	—	—	725	12	1.7
Juba	3	—	—	558	25	4.5
Port Sudan and Suakin :—						
Port Sudan	135	5	3.7	1,827	70	3.8
Port Sudan Prison . .	—	—	—	198	4	2.0
Suakin	—	—	—	72	4	5.6
Suakin Quarantine . .	—	—	—	39	6	15.4
Upper Nile Province :—						
Malakal	13	—	—	3,283	64	1.9
Akobo	—	—	—	9	1	11.2
White Nile Province :—						
Dueim	1	—	—	961	21	2.2
Kosti	—	—	—	614	10	1.6
TOTAL	615	12	1.9	45,418	1,340	2.9

Grand Total . . . . 46,033 admissions, with 1,352 deaths.

TABLE III.

Vaccinations Performed during the Year 1929.

PROVINCE.	Primary.			Re-vaccination.			Total.		
	Success.	Failed.	Unknown.	Success.	Failed.	Unknown.	Success.	Failed.	Unknown.
Bahr-El-Ghazal	256	990	139	5	20	3	261	1,010	142
Berber	28,554	1,102	912	—	—	—	28,554	1,102	912
Blue Nile	21,987	4,080	7,283	256	119	10,496	22,243	4,199	17,779
Darfur	195,250	—	159,750	—	—	—	195,250	—	159,750
Dongola	10,218	2,550	891	1,665	779	138	11,883	3,329	1,029
Fung	21,346	2,555	3,180	749	134	190	22,095	2,689	3,370
Halfa	862	242	6,155	29	—	—	891	242	6,155
Kassala	31,540	4,245	69,480	—	—	—	31,540	4,245	69,480
Khartoum	2,776	257	757	303	118	49	3,079	375	806
Kordofan	18,040	5,285	12,023	609	211	117	18,649	5,496	12,140
Mongalla	607	278	7,286	2,512	1,395	—	3,119	1,673	7,286
Port Sudan and Suakin	783	214	6,548	1,269	100	1,157	2,052	314	7,705
Upper Nile	12,836	327	14,414	251	76	632	13,087	403	15,046
White Nile	1,758	746	4,229	15	185	40	1,773	931	4,269
Total ...	346,813	22,871	293,047	7,663	3,137	12,822	354,476	26,008	305,869

Total of all vaccinations = 686,353

TABLE IV.

Registration of births and deaths by Provinces, 1929.

Province.	Births.				Still Births				Deaths.				Deaths Under One Year of Age	
	European.		Native.		European.		Native.		European.		Native.			
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	No.	Per 1,000
Khartoum	24	22	2,115	2,074	2	—	80	77	18	6	1,156	1,363	281	66.3
Halfa	—	—	767	712	—	—	8	4	—	—	343	511	108	126.4
Red Sea	9	1	168	130	—	—	7	10	8	2	381	267	72	109.4
Berber	2	7	1,520	2,201	1	—	61	42	5	—	1,873	1,834	341	91.8
Dongola	—	—	2,843	2,638	—	—	184	125	—	—	1,203	1,248	464	189.3
Kassala	—	2	701	574	—	—	16	12	—	—	734	482	23	18.9
Blue Nile	4	—	5,979	5,021	—	—	104	67	—	—	4,311	3,473	432	55.5
Fung	—	—	1,995	1,594	—	—	58	32	—	—	1,464	1,065	59	23.3
White Nile	—	—	1,853	1,659	—	—	50	27	2	—	1,025	956	163	82.2
Kordofan	—	—	6,208	5,113	—	—	69	51	3	—	2,262	1,864	208	50.4
Bahr-El-Ghazal	1	—	25	15	—	—	—	—	1	—	21	11	—	—
Upper Nile	—	1	43	48	—	—	—	2	—	—	36	32	—	—
Darfur	—	—	53	36	—	—	3	—	—	—	244	199	20	45.0
Mongalla	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total ...	40	33	25,270	21,815	3	—	640	449	37	8	15,053	10,305	2,171	85.5
Total ...	73		47,085		3		1,089		45		25,358			
Grand Total ...	47,158				1,092				25,403					

Percentage of Stillbirths = 2.31.

TABLE V.

Shows the births, deaths by ages and still births of Khartoum, Berber, Blue Nile and Dongola Provinces, and of Wadi Halfa Merkaz, which are considered to be approximately correct.

NATIONALITY.	Births.		Deaths by ages.							Total deaths.		Total still-births	
	Male.	Female.	Under 1 year	1-5	5-10	10-20	20-40	40-60	Over 60	Male	Female	Male	Female
British	6	4	—	2	1	—	2	1	1	7	—	—	—
Greek	18	17	5	4	—	1	4	3	1	13	5	2	—
Other Europeans	8	7	2	1	—	—	—	1	—	3	1	1	—
Egyptians & Syrians	263	245	48	31	2	6	29	22	14	90	62	7	6
Natives of Sudan	13,547	12,066	1,529	3,795	1,169	1,331	2,948	2,539	3,461	8,620	8,152	425	302
All others ...	8	7	1	1	—	1	15	2	7	18	9	2	1
Total	13,850	12,346	1,585	3,834	1,172	1,339	2,998	2,568	3,484	8,751	8,229	437	309
Grand Total...	26,196		16,980							16,980		746	
% deaths by ages..			9.3	22.6	6.9	7.9	17.7	15.1	20.5				

TABLE VI.

Shows number of out-patients during 1929.

	Total.	%	Free.	%	On Payment.	%
Government Employees ...	348,601	13.03	344,262	12.87	4,339	.16
School Children	207,923	7.77	207,892	7.76	31	.01
Prisoners	128,742	4.81	128,742	4.81	—	—
All others	1,989,819	74.39	1,936,014	72.38	53,805	2.01
Grand Total	2,675,085	100.00	2,616,910	97.82	58,165	2.18

TABLE VII.

Shows Medical Boards and Examinations held during the year 1929.

PLACE.	Sick Leave.		Service South.		Invaliding		Pensionable Service.		*Permanent Service.		Temporary Service.		Check Examination.	Assessment of age.	Grand Total.
	Recd.	Not Recd.	Fit	Unfit	Recd.	Not Recd.	Fit	Unfit	Fit.	Unfit.	Fit.	Unfit.			
Sudan	54	10	63	37	340	60	166	39	387	69	74	7	102	70	1,478
London	36	26	—	—	1	—	—	—	157	—	—	—	—	—	220
Egypt	63	2	—	—	2	—	—	—	1	—	49	15	—	—	132
Syria	13	2	—	—	—	—	—	—	14	—	1	—	—	—	30
	166	40	63	37	343	60	166	39	559	69	124	22	102	70	1,860

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* By Sudan Government Representatives.

TABLE VIII.

List showing hospitals and dispensaries during 1929.

Hospitals and Dispensaries.	Beds equipped
Bahr-el-Ghazal Province.	
Wau	76
Rumbek	30
Raga	12
Tembura	8
Aweil	4
Yambio	14
Travelling Hospital	—
Berber Province.	
Atbara	85
Abu Hamed	6
Berber	—
El-Damer	—
Shendi	10
Wad Hamid	—
Zeidab	—
Kitiab	—
Bouga	—
Blue Nile.	
Wad-Medani	230
Makwar	100
Hag Abdulla	—
Kamlin	—
Managil	—
Rufaa	—
Abdel Galil	—
Abdel Hakam	—
Abdel Rahman	—
Derwish	—
Radma	—
Remeitab	—
Ghubshan	—
Hamed el Nil	—
Hosh	—
Komor	—
Medina	—
Nidiana	—
Sabi Deleib	—
Seleima	—
Tayiba	—
Tebub	—
Wad el Atia	—
Wad Naaman	—
Wad Sadalla	—
Wad Sulfab	—
Hassa Heissa	—
Om Degarsi	—
Istarehna	—
Dolga	—
Amara Kasir	—
Wad el Bur	—
Futais	—
Wad Husseini	—
Keteir	—
Efaina	—
Tabat	—
El Suki	—
Darfur Province.	
El Fasher	36
Geneina	21
Nyala	14
Zalingei	—
Kas	—
Kubbe	—
Kubbum	—
Kuttum	—
Kebkebia	—
Um Keddada	—
Travelling hospital	—
Dongola Province.	
Merowe	49
Dongola	25
Argo	—
Debba	—
El Seir	—
Ghaba	—
Kareima	—
Mansurkolti	—
Nuri	—
Khandak	—
Gureir	—
Fung Province.	
Singa	24
Roseires	35
Karkoj	—
Kurmuk	—
Abu Sheneina	—
Dar Agil	—
Halfa Province.	
Wadi Halfa	28
Abri	—
Delgo	—
Kassala Province.	
Kassala	120
Gedaref	36
Galaat el Nahl	2
Abu Deleig	2
Doka	2
Aroma	4
Derudeib	4
Goz Regeb	2
Khashm el Girba	2
Shawak	2
Hadalyia	—
Degein	—
Mekali	—
Gallabat	5
Hawata	2
Metateib	—
Tendilai	—
Northern Butana T.D.	—
Southern Butana T.D.	—
Derudeib-Makwar T.D.	—
Abu Deleig Bridge	—
Khartoum Province.	
Khartoum	104
Khartoum North	30
Khartoum North Prison	30
Omdurman	121
Wad Nubawi	—
Murada	—
Gebel Aulia	—
Geili	—
Kordofan Province.	
El-Obeid	61
Nahud	30
Bara	8
Abu Zabad	—
Muglad	—
Rahad	9
Soderi	—
Um Ruaba	4
El Odaiya	—
El Sa'ata	—
Sagee el Gamal	—
Talodi	25
Dilling	8
Rashad	—
Kadugli	12
Delami	—
Mongalla Province.	
Mongalla	38
Rejaf	19
Ikotos	14
Nimule	9
Meridi	36
Kajo-Kaji	38
Yei	38
Torit	12
Kapoeta	—
Juba	11
Taali	—
Travelling hospital	—
Port Sudan and Suakin.	
Port Sudan	89
Port Sudan Prison	13
Port Sudan Quay	—
Port Sudan South Side	—
Suakin	10
Suakin Quarantine	21
Tokar	18
Akik	—
Gebeit	12
Gebeit Mines	—
Sinkat	—
Musmar	—
Halaib	—
Port Sudan Quarantine	—
Upper Nile Province.	
Malakal	170
Akobo	6
Abwong	6
Bor	6
Duk Fadiat	8
Duk Faiwil	8
Kaka	4
Fungak	—
Gambela	—
Mwot	30
Ajwong	—
Wegin	15
Lai-Kai	—
Western Nuer	—
Meshra Lai-Kai	—
Targur	—
Adok	—
Warjok	—
Wad Trakl	—
Kodok	12
S.S. Kerreri	—
,, Lady Baker	8
Melut	6
Nasser	—
Renk	—
Shambe	15
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TABLE IX.

Shews Inpatients, Outpatients, Endemic Diseases and Operations during 1928 and 1929.

Province.	Hospi-tals	Dispen-saries	In-patients.		Out-patients.		Bilharziasis.		Trachoma.		Ankyl-ostmiasis.		Malaria.		Syphilis and Yaws.		Operations.	
			1928	1929	1928	1929	1928	1929	1928	1929	1928	1929	1928	1929	1928	1929	1928	1929
Bahr-el-Ghazal ...	6	—	3,386	3,588	202,894	262,143	—	7	—	140	—	29	—	444	—	7,873	—	151
Berber	2	7	2,898	2,448	135,367	145,651	310	663	6,894	12,534	5	20	6,383	5,112	727	973	221	190
Blue Nile ...	2	36	7,944	7,973	162,466	180,735	371	908	4,321	6,025	56	18	18,534	20,786	4,003	2,931	780	508
Darfur	3	8	803	1,522	24,108	115,642	—	1,537	—	2,062	—	—	—	4,225	—	18,212	—	206
Dongola	2	9	1,044	1,164	191,962	290,381	2,548	1,881	17,653	18,153	1,159	752	11,658	2,801	976	1,005	257	291
Fung	2	4	899	1,073	38,837	39,359	46	18	437	1,205	—	—	1,053	4,839	963	892	12	24
Halfa	1	2	529	503	42,249	52,090	298	248	13,613	5,044	7	36	996	238	78	209	67	48
Kassala	2	19	3,708	5,539	130,740	186,478	59	46	2,955	6,067	3	19	6,748	25,142	2,992	2,419	652	528
Khartoum ...	4	4	5,812	6,936	157,467	238,614	224	361	1,908	3,054	20	32	6.188	2,931	2,482	1,984	1,000	921
Kordofan	5	12	3,846	4,148	253,445	369,015	1,436	1,965	3,564	4,320	72	154	11,412	19,077	11,717	11,254	455	501
Mongalla	11	1	3,569	3,681	247,574	400,760	—	37	—	254	—	82	—	1,281	—	4,317	—	159
P. Sudan & Suakin...	4	10	2,237	2,577	113,084	121,650	361	94	2,711	2,434	49	18	642	633	1,627	1,509	216	361
Upper Nile ...	1	30	2,453	3,305	165,540	171,143	125	74	4.100	4,187	126	24	5,335	9,096	11,606	24,702	213	310
White Nile ...	2	8	836	1,576	80,550	92,424	4,502	4,072	3,993	3,679	536	180	3,690	7,371	3,430	4,149	40	139
Travelling * ...	3	—	—	—	58,000	—	—	—	—	—	—	—	—	—	—	—	—	—
	50	150	39,845	46,033	2,004,283	2,675,085	10,280	11,911	62,149	69,168	2,033	1,364	72,639	103,976	40,601	82,429	3,913	4,337

* Included in provinces in 1929.

TABLE X.

Statement of expenditure during the year 1929 and budgetary estimates for 1930.

ITEM.	1929 Actual Expenses.		1930 Budget Estimates.	
	£E.	£E.	£E.	£E.
(1) **Headquarters.**				
Personnel	10,755	—	11,421	—
Allowances and Services	19,099	29,854	21,395	32,816
(2) **Bahr-el-Ghazal Province** :—				
Personnel	5,655	—	7,002	—
Allowances and Services	7,570	13,225	7,861	14,863
(3) **Berber Province** :—				
Personnel	6,327	—	6,300	—
Allowances and Services	4,672	10,999	5,907	12,207
(4) **Blue Nile Province** :—				
Personnel	14,051	—	16,467	—
Allowances and Services	15,669	29,720	19,203	35,670
(5) **Darfur Province** :—				
Personnel	1,150	—	1,919	—
Allowances and Services	3,133	4,283	4,010	5,929
(6) **Dongola Province** :—				
Personnel	4,378	—	4,350	—
Allowances and Services	4,198	8,576	5,090	9,440
(7) **Fung Province** :—				
Personnel	1,794	—	2,196	—
Allowances and Services	2,128	3,922	2,600	4,796
(8) **Halfa Province** :—				
Personnel	1,829	—	2,232	—
Allowances and Services	1,460	3,289	1,727	3,959
(9) **Kassala Province** :—				
Personnel	5,160	—	6,315	—
Allowances and Services	7,851	13,011	9,060	15,375
(10) **Khartoum Province** :—				
Personnel	12,860	—	13,353	—
Allowances and Services	24,282	37,142	26,763	40,116
(11) **Kordofan Province** :—				
Personnel	8,641	—	9,634	—
Allowances and Services	9,677	18,318	10,976	20,610
(12) **Mongalla Province** :—				
Personnel	5,703	—	5,838	—
Allowances and Services	8,313	14,016	8,790	14,628
(13) **Port Sudan and Suakin** :—				
Personnel	7,478	—	8,916	—
Allowances and Services	9,405	16,883	11,290	20,206
(14) **Upper Nile Province** :—				
Personnel	5,308	—	6,692	—
Alowances and Services	11,151	16,459	13,029	19,721
(15) **White Nile Province** :—				
Personnel	2,214	—	3,363	—
Allowances and Services	2,732	4,946	3,774	7,137
	—	224,643	—	257,473
Deduct :—				
Recoveries from other sources	—	14,859	—	14,400
TOTAL	—	209,784	—	243,073

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